



CJS/ek4 10/5/2016

FILED

10-05-16

09:01 AM

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking into Policies
to Promote a Partnership Framework
between Energy Investor Owned Utilities
and the Water Sector to Promote
Water-Energy Nexus Programs.

Rulemaking 13-12-011
(Filed December 19, 2013)

**ASSIGNED COMMISSIONER'S RULING ENTERING WORKSHOP REPORTS
INTO THE RECORD AND SEEKING COMMENTS**

Table of Contents

Title	Page
ASSIGNED COMMISSIONER’S RULING ENTERING WORKSHOP REPORTS INTO THE RECORD AND SEEKING COMMENTS.....	1
1. Proceeding Scope.....	2
2. Proceeding Workshops.....	5
3. Proceeding Meta-Themes, Water/Energy/Communications Nexus	11
3.1. Communications.....	11
3.2. Agricultural Sector Needs Communications Facilities and Services to Optimize Water and Energy Needs	12
3.3. Distributed Energy Resources Require Communications to Interconnect to the Grid.....	12
3.4. Distributed Water Facility, Water Production, and Watershed Communications Needs	14
3.5. Watershed Management.....	15
3.6. Communications Facilities for Disaster Response.....	16
3.7. Reduce Leaks.....	18
3.8. Data.....	19
3.9. Other Meta-Themes.....	19
4. Becoming a Party; Joining and Using the Service List.....	19
 Attachment A - Report on August 13, 2014 Water-Energy Nexus Actions to Address the Drought Workshop	
 Attachment B - Report on September 10, 2014 Communications-Water-Energy Nexus Workshop	
 Attachment C - Summit on Water Technology & the California Drought: Leveraging Technology to Build a Drought Resilient California	
 Attachment D - Joint Workshop of the California Public Utilities Commission, the California Office of Emergency Services and the California Department of Technology to discuss Federal Connect America Fund (CAF) to build out broadband and telecommunications infrastructure in California’s rural and high cost areas.	

Table of Contents (Cont'd)

Title	Page
Attachment E - Workshop Report on Establishing a Cloud-Based Water and Energy Data Platform UC Davis (June 9-10, 2016)	
Attachment F - Summary and Questions Arising from Workshop on the Water-Energy-Telecommunications Nexus for Water and Energy Management, Infrastructure Safety, Public Safety, and Fire Safety	
Attachment G - Comments of the Edison Electronic Institute	

ASSIGNED COMMISSIONER'S RULING ENTERING WORKSHOP REPORTS INTO THE RECORD AND SEEKING COMMENTS

In today's ruling, I am entering a series of six workshop reports into the record of this proceeding. I identify some preliminary themes in these workshop reports and invite parties to comment on the reports themselves and the themes arising from the proceeding more broadly.

1. Proceeding Scope

On April 27, 2015, I issued an Amended Scoping Memo in this proceeding incorporating actions related to the water-energy nexus to address Governor Brown's Executive Order B-29-15 relating to the drought emergency (issue 3), actions to address the water-energy nexus in water conveyance, delivery, and use for water storage... water recharge ... water delivery, and other areas including enabling demand response and time shifting (issue 4, bullet 1), actions to address the water-energy nexus in energy production, transmission, distribution, and use, design, deployment, and utilization of onsite micro grids, construction and design of energy generation, storage and management facilities, implementation of demand response, ancillary services, grid services, advanced grid services; and interconnection issues, ownership issues for maximum effectiveness; in agricultural pumping and irrigation, in residential and commercial landscaping; in current and potential for water recycling efforts and programs; and in maximizing local water sources (issue 4, bullet 2).

Water and energy utility coordination on energy smart meter piggybacking pilots and the water/energy nexus cost calculator are only the first of many steps in fully considering the water/energy nexus. We also need to ensure that adequate telecommunications infrastructure is accessible to enable proper management of water and energy. Reliable and affordable

telecommunications is necessary for distributed energy resources (DERs) and energy facilities, all water pumping, treatment, processing, recycling, and desalination operations. Each of these facilities are energy intensive and produce operations data that must be managed. This management, if optimized, could benefit both the water and energy ratepayer through more reliable service, lower overall costs, and enhanced stewardship of our natural resources. This information exchange can happen over a variety of telecommunications technologies.

Our goal is to review the capabilities of energy and water utilities, and other investor owned utilities and respondent telecommunications carriers to take the necessary actions to promote water management and conservation, energy management and conservation, and broadband infrastructure access and deployment as telecommunications and internet facilities and services are increasingly crucial to water and energy management, resources use, and public safety. By breaking down silos, we promote utility collaboration to solve big problems through coordinated effort.¹

The Water-Energy-Communications Nexus track of this proceeding examines the nexus of water, energy, and communications (*e.g.*, the use of information management and data systems, high-speed internet access, social media and apps, Supervisory Control and Data Acquisition (SCADA) systems), for energy facility management, DER integration, water system management, water treatment and the communications needs in SCADA and other systems,

¹ Amended Scoping Memo, at 2 (Collaboration between utilities saves ratepayers from double paying and can provide access to operational information about water and energy resources and facilities that are critical to their deployment and can increase the reliability and safety of service.).

and steps to foster access to energy and communications technologies, and facilities that enable electricity system and water system management, water storage, treatment, and use, including for wildfire and other public safety measures, in a manner that addresses the water-energy nexus.

Telecommunications enables the collection and transmission of data to facilitate energy, DER, and water facility action and analysis based on data. Described herein as internet access, internet access describes all possible physical configurations of telecommunications services that provide access regardless of the technology.

The Water-Energy-Communications Nexus will also evaluate access to electric, gas, storage, renewable energy, and other power infrastructure as an enabling technology to address the water-energy nexus, including the link between power access and communications facilities; broadband internet access for water storage, treatment, conveyance, recharge, recycling, managers, utilities, and users; and consider steps to promote such access to address the water-energy nexus.

As indicated by the Edison Electric Institute (EEI) survey of its members for the Federal Communications Commission Internet Protocol Transition proceeding attached hereto as Attachment G, many EEI members including those in California use telephone facilities and services to transmit data through protocols including frame relay. A data request in the instant proceeding will elicit information on the types of telecommunications facilities and services water and energy utilities under this Commission's jurisdiction use to manage their operations and gather data. While the ongoing evolution of communications technology and deployment of communications technology may change the method of data transmission, access to reliable communications is increasingly

critical to optimize water and energy facility operations and management as our state acts against climate change and this Commission works to reduce Greenhouse Gases (GHGs) associated with the electric, natural gas, and water sectors. The water energy telecommunications nexus explores the critical role of telecommunications for the optimization and management of water and energy.

Today's Assigned Commissioner's Ruling introduces a series of workshop reports regarding the telecommunications/water/energy nexus and questions related to them.

2. Proceeding Workshops

Six workshops have been held in the Water-Energy-Telecommunications Nexus portion of the Water-Energy Nexus Proceeding, R. 13-12-011: August 13, 2014; September 10, 2014; July 10, 2015; October 30, 2015; June 9-10, 2016; September 9, 2016; and two final workshops will be held on September 29, and October 20, 2016. Reports for all of these workshops are attached to this ruling in the appendix. Reports on the September 29, and October 20, 2016 workshops will be issued for comment shortly after the conclusion of that workshop. The following workshop reports are incorporated into the proceeding for public comment and reply comment. We request that parties comment on the topics discussed in the workshops and on the summary of themes raised in the workshops. Parties may also submit additional information and studies for consideration in the proceeding as appropriate and responsive to the proceeding scope.

August 13, 2014 Workshop

On August 13, 2014, the workshop focus was how the state utilities could collaborate to combat the drought. The workshop explored: How can water utilities increase the amount of data procured and communicated both within the

utility and to others to enable better data-driven decisions? How can telecommunications help with data gathering, enabling new technologies for water and energy management, analysis, and use?

A Workshop Report and the Workshop outline are Attachment A to this ruling. The video webcast of the workshop can be accessed at:

http://archive.adminmonitor.com/cpuc/real/CPUC_WS081314-1.rm.

We seek comment on the Workshop Report, and suggestions about what steps the Commission should take in this or other proceedings to address the issues raised in this workshop.

September 10, 2014 Workshop

On September 10, 2014, the workshop focus was how internet access could assist with water management by utilities, customers, and farmers, in agricultural areas, and how data driven decision making about water and energy use can combat the drought. Many speakers highlighted the potential role of data about energy and water use in the agricultural sector to provide more information to customers about water use, better manage water and energy, reduce GHGs, and combat the drought. Several speakers highlighted the lack of access to communications facilities and services as a barrier to use of communications, information, and internet technologies for water monitoring and management. The lack of telecommunications facilities and services occasionally occurs in urban or suburban areas where gaps make accessing communications services difficult to impossible in some areas. In rural areas including on many farm fields, telecommunications facilities and services are lacking; while the farmer's house or office may have a phone or some internet access, the farmer's field lacks any communications technologies, and in many cases also lacks access to electricity. These infrastructure deployment gaps limit

or inhibit the use of telecommunications technologies, particularly in California's watershed and rural areas, and therefore limits or inhibits the use of advanced technologies to optimize and manage water and energy resources.

A Workshop Report and the Workshop outline are Attachment B to this ruling. The video webcast of the workshop can be accessed at:

http://archive.adminmonitor.com/cpuc/real/CPUC_WS091014-1.rm and

http://archive.adminmonitor.com/cpuc/real/CPUC_WS091014-2.rm.

We seek comment on the Workshop Report, and suggestions about what steps the Commission should take in this or other proceedings to address the issues raised in this workshop.

July 10, 2015 Summit

On July 10, 2015, Governor Jerry Brown convened a summit to discuss the landscape of water technology to help combat the drought: How can advanced water technologies be used to optimize state resources? How can water utilities collect and produce more data to optimize system use? What barriers are posed by the lack of robust internet access in rural and agricultural communities and on farmland, and how can we overcome those barriers? Speakers discussed several topics including the lack of communications infrastructure, particularly in rural areas, that complicates disaster and public safety response, often elongating the time needed to fight a fire or respond to emergencies. Fighting wildland fires requires large amounts of water, often drawn from nearby reservoirs or lakes. Fires such as the 2013 Rim fire emit more GHGs than three coal fire power plants operating for a year. Fire risks people's lives and property and may also damage utility infrastructure such as San Francisco Public Utilities Commission's Hetch Hetchy water delivery facilities and electricity transmission infrastructure.

A Summit Theme Summary and the Summit Information are Attachment C to this ruling. The Summit Information can also be accessed at:

https://www.gov.ca.gov/s_watertechsummit.php. The video webcast of the summit can be accessed at:

<https://www.youtube.com/playlist?list=PLt1xE2ga7V3TNhhsthbBRw48nX03eGAs1>.

We seek comment on the Summit Theme Summary, and suggestions about what steps the Commission should take in this or other proceedings to address the issues raised in this summit.

October 30, 2015 Workshop

On October 30, 2015, a Joint Workshop of the California Public Utilities Commission, the California Office of Emergency Services and the California Department of Technology focused on how all energy generating and energy management facilities that are members of the California Independent Systems Operator (CAISO) or Investor Owned Utility community must abide by CAISO and utility set rules to provide information about the facility to CAISO and the utility as part of the electricity system. Rules about telemetry (electricity's term for system communications) require compliance to ensure proper accounting. Telemetry facilities and services must comply with CAISO technical rules and utility rules under Electric Tariff Rule 21 and take into account the electrical environment, *e.g.* transients at an electric substation. Renewable energy generation is the most common types of facility requesting to connect with CAISO and the utilities. Telecommunications facilities are critical for energy generation visibility, optimization and management, and grid management, and can lead to grid and energy system savings and greenhouse gas reduction.

Telecommunications facilities are also critical for water system management, visibility and optimization.

A Workshop Report and the Workshop Agenda are Attachment D to this ruling. The video webcast of the workshop can be accessed at: Part 1:

<http://www.ustream.tv/recorded/76634731> and Part 2:

<http://www.ustream.tv/recorded/76648674>.

We seek comment on the Workshop Report, and suggestions about what steps the Commission should take in this or other proceedings to address the issues raised in this workshop.

June 9-10, 2016 Workshop

On June 9-10, 2016, UC Davis hosted a workshop focused on water utility data gathering, data sharing and data management to optimize decision making, coordination between water and energy utilities, improve water and energy management, and identify and address leaks and other water and energy system issues. There was an emphasis on data privacy issues and cyber security. Speakers discussed best practices of electric and water utilities from which each sector can draw. Included in the workshop report are a number of questions about data availability to the water sector.

A Whitepaper Summary and the Workshop Theme Summary are Attachment E to this ruling. We seek comment on the Workshop Report, and suggestions about what steps the Commission should take in this or other proceedings to address the issues raised in this workshop.

September 9, 2016 Workshop

On September 9, 2016, the workshop focused on how lack of communications infrastructure complicates disaster response including wildfire response especially in the first critical days of the disaster. Speakers suggested

California should look at forestry management and rangeland management to increase water from snowpack and watershed to increase hydroelectricity potential, reduce debris flow and chemical runoff that affect hydro and water facilities, ensure drinking water and water for use in energy and other industries, protect transmission lines and reduce greenhouse gas emissions. Some rural communities in California are experimenting with innovative ways to promote land management for the benefit of their communities and the natural resources located in their jurisdictions. Speakers shared many reports of poor to failed telecommunications services during times of emergency such as wildfires; as telecommunications lines and poles burned communications including 9-1-1 became unavailable, especially in areas where the telecommunications system lacked route or technical diversity. Speakers discussed proposals by local governments to enhance local safety response by installing sirens, coordinating with ham radio operators, and developing other systems to create higher levels of reliability and operational diversity to protect the public.

A Workshop Power Point and Workshop Theme Summary are Attachment F to this ruling. We seek comment on the Workshop report, and suggestions about what steps the Commission should take in this or other proceedings to address the issues raised in this workshop.

Additional Workshop Reports Expected

Workshop reports on two additional workshops are expected for workshops on September 29, 2016 – Workshop on the Water Energy Telecommunications Nexus for Water and Energy Management, Infrastructure Safety, Public Safety, and Fire Safety and October 20, 2016 – Communications for Optimized Water and Energy Management.

3. Proceeding Meta-Themes, Water/Energy/Communications Nexus

The Workshops and record in this proceeding have highlighted the following eight “Meta-Themes.” Please comment on the themes below and what action the Commission should take to address these Meta-Themes in the Water/Energy/Communications Nexus Proceeding or through other proceedings or actions. In addition, the workshop reports that are attached identify additional questions for parties to respond to.

3.1. Communications

Accessible and reliable communications at competitive prices are required for all California water and energy facilities and services. Many facilities, particularly in rural and remote areas, lack access to communications facilities and services. Distributed energy resource (DER) deployments across the state will require communications facilities to detail operations to DER managers, utilities and CAISO. Increasing access to communications facilities and services is a foundational enabler to address each of the Meta-Themes in this proceeding.

Questions: What actions should the Commission take to increase accessible and reliable communications at competitive speeds and prices for California water and energy facilities and services? Should the Commission require the filing of tariffs by carriers of last resort or others for communications carriers specifically for energy facilities better manage both water and energy? What actions should the Commission take to leverage investments through federal communications expansion programs such as the Connect America Fund (CAF), the extreme high cost area fund that is the subject of a current FCC proceeding, federal Rural Utility Service (RUS) funds, the California Teleconnect Fund (CTF), the California Advanced Services Fund (CASF), and other programs and funding sources to optimize the distributed energy resources interconnected

to the electric grid to manage the water and energy needs of Californians at the production, generation, conveyance, transmission, distribution, facility, and consumption/behind the meter level? Should the Commission require communications tariffs to be filed for distributed energy services, other energy or water services and facilities?

3.2. Agricultural Sector Needs Communications Facilities and Services to Optimize Water and Energy Needs

The Agricultural Sector is largest user of water in the state of California, and uses energy through the process of accessing, conveying, treating, and using water. The agricultural sector lacks access to communications facilities and services in many areas that would allow it to create and analyze data to better manage water and energy use.

Questions: What role does the lack of access to communications facilities and services play in inhibiting agricultural use and optimization of water and energy data to improve management of water and energy? What steps should the Commission take to improve reliable access to communications at competitive speeds and prices for water and energy services, management, and use that could be harnessed by the Agricultural sector? In addition to leveraging state and federal communications expansion programs described above, are there other steps the Commission should take?

3.3. Distributed Energy Resources Require Communications to Interconnect to the Grid

Distributed energy resources are defined by AB 327 in California Public Utilities Code 769 (a) as “distributed renewable generation resources, energy efficiency, energy storage, electric vehicles, and demand response technologies.” Each of these distributed energy resources (DERs) need accessible and reliable communications at competitive speeds and prices to meet CPUC, CAISO, FERC,

NERC, and other requirements for visibility, management, operation, system and user optimization. Many California areas where distributed energy resources and electric/alternative fuel vehicles and charging stations could be deployed lack communications facilities and services, particularly in rural areas. This mismatch raises construction and transaction costs for energy ratepayers, delays deployment of renewable energy resources and electric/alternative fuel vehicles, achievement of GHG reduction targets, and must be solved to comply with state laws for renewable energy sources, GHG and black carbon reduction.

Questions: What actions should the Commission take in this and/or other proceedings to encourage deployment of reliable communications that meet state and federal standards for distributed energy resources? How do the standards for DERs communication affect the Commission's action and the market for DERs? How does the technical environment of electric facilities affect communications needs and access, e.g. do transients at substations limit the use of certain technologies for substation communication and how can the Commission ensure access to facilities and services that meet those needs? Are current protocols sufficient to notify DERs operators and users about communications outages that affect their resources? Communications carriers are required to notify the FCC when an outage affects 900,000 user minutes or 667 OC3 minutes² under the FCC Network Outage Reporting System (NORs). Is the NORs standard sufficient to notify DERs producers and users including energy resource facilities and electric vehicle charging station operators, aggregators and users about communications system outages that these

² User minutes refers to the time in which users are not able to place calls, while OC3 minutes refer to the time the Internet and similar information services are inaccessible.

facilities? For example, if an electric vehicle charging station requires a credit card for a vehicle user to receive a charge, if communications services that enable the credit card reader are not functioning, the user cannot charge the vehicle³. What, if any, steps should the Commission take to notify distributed energy resource managers, aggregators, users and electric vehicle operators, or other DERs operators, about communications outages that affect their ability to use services. What are the safety implications of which the Commission should be aware? Should the Commission host a website or develop an app to allow consumers to report communications or electrical outages that affect their ability to use DERs and to facilitate access to the CPUC's Consumer Affairs Branch? How should California leverage deployment of communications facilities to households funded by the federal programs including but not limited to CAF, and state programs to provide reliable communications distributed energy resources and electric/alternative fuel vehicles and charging stations?

3.4. Distributed Water Facility, Water Production, and Watershed Communications Needs

Water production resources, watersheds, and water treatment facilities of all varieties need accessible and reliable communications at competitive prices to meet CPUC, State Water Resources Control Board, EPA, and other federal and state standards and laws. Many water facilities, water production sources and watersheds are located in areas where few or no communications facilities and services are available for reliable water monitoring, operation, and reporting.

³ Communications outages also render inoperable fossil fuel gas stations that rely solely on credit card machines. Many such unmanned stations are located in rural California.

The lack of such facilities and services can lead to contaminated water, risking public health and non-compliance with state and federal water laws.

Questions: What actions should the Commission take in this and/or other proceedings to encourage deployment of reliable communications for water facility, water production management optimization, and watershed communications needs? What state and federal standards affect the communications protocols for water facilities and services and watershed management, monitoring and operation, e.g. federal clean drinking water standards, state requirements for information about water withdrawals from surface or ground water? How should California leverage deployment of communications facilities to households funded by the federal programs including but not limited to Connect America Fund, and state programs to provide reliable communications water facility, production, and watershed communications facilities and services?

3.5. Watershed Management

Watershed management is necessary to protect water and energy resources and facilities, reduce wildfire and drought risk, and promote safety, reliability, and just and reasonable electric and water rates. Watershed management can yield more water for hydro-electric generation, water used for electric cooling, water used by the residential, commercial, industrial, and agricultural sector, and yield ratepayer benefits for water managers, retailers and communities. Managing watershed to reduce fire risk can help prevent catastrophic events such as fire and debris flow from flooding that affect utility resources and today result in ratepayer costs paid through a Catastrophic Event Memorandum Account (CEMA).

Questions: Should the Commission require energy utilities to file applications for pilots for Watershed management to increase water yield for hydro-electric or other electric generation, reduce wildfire and debris flow risk, and reduce catastrophic event risks that led to CEMA accounts, risks to ratepayers and facility safety, reliability and affordability? Should the Commission require applications to be filed for pilots by investor-owned water utilities? Should the Commission require that the pilots involve collaboration between water and energy utilities or agencies, communications technologies, or collaboration methods such as local or tribal consultation, or other program leveraging to improve watershed management? What other steps can the Commission take to address these issues?

3.6. Communications Facilities for Disaster Response

Many disasters and emergencies such as wildfire occur in areas where communications facilities and services are sparse or not deployed but both water and energy infrastructure requires safeguarding during disasters.

Communications are increasingly critical for wildland fire-fighting as a way to obtain and monitor wind and weather conditions, order helicopters and support personnel, and obtain resources to fight fire or handle disasters, and to coordinate evacuations. Current practice requires ordering a Cell On Wheels (COW) or Cell on Light Truck (COLT) once the fire or disaster breaks out if communications facilities and services are not available or adequate for public safety needs. Building COW or COLT facilities to order and connecting public safety agents with the backhaul necessary⁴ to carry the call, text, or data traffic

⁴ The backhaul refers to the part of the telecommunications network that connects the main body of the network with smaller subnetworks.

from the disaster response site takes several days at best, and may take a week to ten days or more if few COWs or COLTs are available and establishing the backhaul link requires construction or agreements with other carriers. The significant time needed to establish a connection through a COW or COLT, and the limitations of satellite or other communications technologies in mountains, canyons, forest areas, and many disaster areas leads to communications gaps during the critical first days and weeks of a disaster that occurs outside of areas where communications facilities and services are widely deployed. These delays put the public at risk and may coincide with a fire burning energy and water facilities including distribution or transmission lines, poles, other energy or water facilities at the generation or customer side, and telecommunications facilities like cell towers. Elongating fire and disaster response and evacuation in areas with poor to no communications increases risks to public safety and the safety and reliability of utility water and electricity infrastructure, and increases the release of greenhouse gases. Such fires and disasters increase ratepayer costs borne through CEMA accounts for electric and gas utilities, and result in costs for water and communications utilities ultimately passed on to ratepayers.

Questions: What steps should the Commission take to promote access to communications for disaster response and water and energy facility protection, particularly in rural areas with poor to no communications? Should the Commission order carriers of last resort, energy, and water utilities to meet with the CPUC, Cal OES, County OES offices, Counties, other localities, and first responders including tribal first responders, or other state agencies to propose communications deployment plans and leverage other communications infrastructure buildouts from federal and state grants? The FirstNet system for first responder communication is still being planned by the federal government

and it is not yet known whether it will be adequate to meet California's disaster needs, particularly in rural and remote areas. What steps should the Commission take to protect public safety, and electric, water, and communications reliability, safety, and infrastructure as FirstNet is being developed? What steps should the Commission take to address these gaps before the full deployment of the CAF-funded networks in 2021, and the potential deployment of networks in extremely high cost fund areas subject to the FCC proceeding? What steps should the Commission take to leverage FirstNet, CAF, and other federal and state funds to meet communications needs for disaster response that directly affect energy and water facilities, operations, management, and services?

3.7. Reduce Leaks

Following Governor Brown's Executive Order B-37-16 issued May 9, 2016, the CPUC must take steps to identify and fix water leaks to better manage water and the embedded energy in water. Deployment and use of communications technologies and services can help detect leaks, trigger action to fix them and better manage water and energy. Other proceedings including the Balanced Rates Order Instituting Rulemaking (OIR) are examining Advanced Metering Infrastructure (AMI) and other metering options for water utilities.

Questions: What steps should the Commission take to promote the deployment and use of communications facilities, technologies, and services to identify leaks and promote better water and energy management? Should the Commission order carriers of last resort to file tariffs for water management including leak detection? May carriers who have federal CAF funding build mesh networks or other networks leveraging the facilities built for CAF to provide services for water leak detection in CAF-eligible areas? What other

sources may the Commission leverage to deploy communications facilities and services to support leak detection?

3.8. Data

Water data including data about water utility systems operation, the embedded energy in water and water production, conveyance, distribution, and consumption is necessary for water and energy management, operation, planning, and for service to all Californians.

Questions: What steps should the Commission take to enable the gathering, sharing, and analysis of water data? How do these steps differ in urban vs. rural areas, or for different sectors, residential, commercial, industrial or agricultural? What steps should the Commission take to protect user privacy and cybersecurity for water data? Should the Commission order greater use or aggregated level sharing of water data for the CPUC, other state, local, or federal agencies, or access to data for researchers as it did for energy data?

3.9. Other Meta-Themes

Are there other “Meta-Themes” that arose from the proceeding scope that the Commission should address in the Water-Energy Nexus Proceeding? If so, please suggest other Meta-Themes from this proceeding and appropriate Commission action to address that theme.

4. Becoming a Party; Joining and Using the Service List

The existing service list will continue be used for this phase, as discussed more below. The existing service list can be viewed on the Commission’s web page for this proceeding.

Respondents: The OIR named Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, Southern California Gas Company, Alpine Natural Gas Operating Company,

Bear Valley Electric Service, California Pacific Electric Company, Liberty Utilities, PacifiCorp, Southwest Gas Company, Southwest Gas Corporation, West Coast Gas Company, each of the Class A Water utilities

Other Parties: Persons who are not already on the service list for this proceeding may request party status by filing a written motion or by making an oral motion at a prehearing conference if one is held (see Rule 1.4(a)(3) and (4)). Only one representative per party will be listed in the “Parties” category. Additional representatives will be added as “Information Only.”

Information Only: Persons now in the “Information Only” category will remain in that category. A person seeking to be included to that category will be added to the “Information Only” category of the official service list upon request to the Process Office. Persons must provide an e-mail address in order to receive service of documents that are not required to be served by hard copy. (*See* Rule 1.10(b).) Persons may request the ALJ to require additional service as appropriate.

Act Now to Receive Opening Comments: Persons not now on the service list who wish to receive service of the opening comments, and who intend to become parties, should immediately file a motion for party status. Other persons not now on the service list who wish to receive service of opening comments should immediately contact the Process Office to request addition in the appropriate category.

Send your request to the Process Office: You may use e-mail (process_office@cpuc.ca.gov) or letter (Process Office, California Public Utilities Commission, 505 Van Ness Avenue, San Francisco, California 94102). Include the following information:

Docket Number of this rulemaking (R.13-12-011);

Name (and person or entity represented, if applicable);

Postal Address;

Telephone Number;

E-mail Address; and

Whether you request “State Service” or “Information Only.”

It is the responsibility of each person or entity on the official service list in any category to ensure that its designated person for service, mailing address and/or e-mail address shown on the official service list are current and accurate.

Subscription Service: You can also monitor the rulemaking by subscribing to receive electronic copies of documents in this proceeding that are published on the Commission’s website. There is no need to be on the service list in order to use the subscription service. Instructions for enrolling in the subscription service are available on the Commission’s website at <http://subscribecpuc.cpuc.ca.gov/>

Public Advisor: Please direct questions about becoming a party to the proceeding to the CPUC Public Advisor.

E-mail: public.advisor@cpuc.ca.gov Telephone: 1-866-849-8390.

IT IS RULED that:

1. Comments and reply comments are sought on the attached workshop reports, meta-themes and questions, and workshop report themes and questions.
2. Comments shall be filed on Wednesday, October 19, 2016.
3. Reply comments shall be filed on Friday, October 28, 2016.

4. A workshop will be held on Communications for Optimized Water and Energy Management on October 20, 2016 at the California Public Utilities Commission, located at 505 Van Ness Avenue, San Francisco, California 94102.

Dated October 5, 2016, at San Francisco, California.

/s/ CATHERINE J.K. SANDOVAL

Catherine J.K. Sandoval
Assigned Commissioner

ATTACHMENT A

Report on August 13, 2014 Water-Energy Nexus Actions to Address the Drought Workshop

Prepared by Commissioner Sandoval's Office

Background

This workshop was held by Commissioner Catherine J.K. Sandoval in response to the drought emergency. The purpose of the workshop was to discuss and identify immediate actions that can be taken to address the drought and identify and address barriers to implementation of immediate drought response. The workshop consisted of several panels and public comment. Video of the workshop in RealPlayer format can be found at:

Water/Energy Nexus Workshop on Aug. 13, 2014

http://archive.adminmonitor.com/cpuc/real/CPUC_WS081314-1.rm

The Agenda for the Workshop is provided here, along with a summary of primary themes and an outline of the workshop proceedings prepared by Commissioner Sandoval's Office.

Agenda

9:30-9:35 Welcome and Opening Remarks – Commissioner Sandoval and other Commissioners in attendance

9:35-10:15 Drought update/report

Moderator Bruce DeBerry, CPUC, Division of Water and Audits

Drought Response Tina Curry, Deputy Director, Governor's Office of Emergency Services (Cal OES)

Supply Report Bill Croyle, California Department of Water Resources

Water Board Proposals Max Gomberg, Climate Change Advisor, California State Water Resources Control Board

Data on Water IOU Consumption and Conservation Jack Hawks, Executive Director, California Water Association

10:15-11:30 Panel on Agricultural, Commercial/Industrial Water-Energy Nexus & the Drought

Moderator Robert Tse, Regional Rural Economic, Broadband, Ag Tech Development Strategies, SDACA-Rural Development

David Zoldoske, Ed.D. Director, Center for Irrigation Technology, CSU Fresno

Peter Canessa Agricultural Engineer, Program Manager, Advanced Pumping Efficiency

Program, CSU Fresno

Julien Gervreau Senior Sustainability Manager, Jackson Family Wines

Olivier Jerphagnon Founder, PowWow Energy, Inc.

Dawn Welch Director of Commercial and Industrial Services, SDG&E

11:30-12:30: Panel on Residential Water-Energy Nexus & the Drought

Moderator Robert Castaneda, Director of Market Development, Proteus; Member of CPUC Low Income Oversight Board

Peter Yolles CEO, WaterSmart

Charles Bohlig Supervisor of Water Conservation, East Bay Municipal Utility District

Morrice Blackwell New Product Sales and Market Development Manager, Badger Meter

Kevin Jefferson Director of Research, Urban Releaf

Kevin Shore Commercial and Industrial Segment Manager, SoCalGas

Danilo Sanchez CPUC, Office of Rate Payer Advocates

12:30-1:30: Lunch On Your Own

1:30-2:30- Intra-agency Coordination: Aligning Energy Efficiency, Energy Savings Assistance Program, Water Programs to Address the Drought

Moderator Steve St. Marie, CPUC, Policy and Planning Division

Karen Zelmar Director of EE programs, PG&E

Ben Chou Policy Analyst, Water Program, NRDC

Rory Cox CPUC, Energy Division

Patrick Hoglund CPUC, Energy Division

Cynthia Mitchell, The Utility Reform Network

Veronica Gutierrez Vice President Local Public Affairs, SCE

Michael Campbell CPUC, Office of Rate Payer Advocates, Program Manager

2:30-3:30 Interagency Coordination to Address the Drought:

Moderator Lisa Beutler, Executive Facilitator, California Water Plan and Water Resources Group, MWH Americas

Jared Blumenfeld Regional Administrator, U.S. Environmental Protection Agency

Debbie Davis Community and Rural Affairs Advisor, Office of Planning and Research (OPR),

Governor Brown's Office

Diana Brooks, California Department of Water Resources

Bill Croyle California Department of Water Resources

Kelley Gage Principal Water Resources Specialist, San Diego County Water Authority

3:30- 4:00: Public Comment

4:00-4:30: Closing Remarks and Comments by CPUC Commissioners

Major Themes and Questions

1. California's agencies and utilities ought to collaborate more to align energy efficiency, energy saving assistance programs, and water programs to address the drought and better manage water and energy.
 - A. How can the CPUC guide water, telecommunications and energy utilities to making innovative system upgrades that also assist in conservation, or reduction of service? How should the CPUC direct energy and water utilities to focus on innovation, focus on the agriculture sector, industrial areas and customers to conserve both water and energy? How can the CPUC support and collaborate with the forest service, US army core of engineers, Tulare work force, emergency response planning?
 - B. How can the CPUC target and address water system leaks, water leaks in customer-side equipment, and equip water systems and customers with conservation technologies and conservation education (especially school children)? How can the CPUC integrate the water, energy, and telecom industries to enable emerging technologies to be implemented and effective across all geographic areas?
 - C. Should the CPUC order water, energy and telecommunications utilities to meet and confer with the CPUC on the following items, develop a roadmap of collaboration, with critical target dates and achievement benchmarks?
 - Emergency management coordination in case of water shortages, planning
 - Move toward real time data
 - Water education to local political jurisdictions / government offices / kids – partnerships with political & schools

- Workforce education/training programs that take disadvantaged communities and train them to perform sustainable work – teach and promotes both behavioral and structural changes
 - Partner with CalEPA, public schools
 - Data gathering and delivery methods – water audits, flow measuring devices, data gathering / analyzing / analysis communication for decision-making purposes (business & residential) – innovative data mining & reporting process [enable the filing of an application for consideration / better collaboration with GREEN BUTTON
 - Renewable energy in the water system, ag, residential, commercial, industrial
 - Encourage further water conservation and movement towards recycled water or to create the equivalent of the water megawatt
 - Reduce pump inefficiency for agricultural sectors?
2. The water energy nexus policy and program sector has a ways to go in order to achieve overall system improvements, behavior changes and better coordination between water and energy utilities. Water loss and “non-revenue water” (treated, potable water that never makes it to the customer for delivery) can be reduced when leaks are targeted and fixed promptly. Reducing water leaks conserves both water and energy resources needed to procure, collect, treat and move the “non-revenue” or “lost” water waylaid through a pipe leak on its way to being delivered to customers.
- A. How can the CPUC foster greater partnerships between water and energy utilities and leverage different sources of funding to further reduce water loss due to leaks? How might the CPUC better promote water audits,

partnerships with agriculture water users, customer side programs and foster partnerships to help conserve water and energy? What types of partnerships might be most useful?

Workshop Outline

a. Introduction

- i. **Commissioner Sandoval** – Urgent issue as seen by water restrictions being issued by water utilities, forest fires, communications issues, etc.

b. Drought update/report

- i. Moderator - *Bruce DeBerry*, CPUC, Division of Water and Audits
- ii. Drought Response *Tina Curry*, Deputy Director, Governor's Office of Emergency Services (Cal OES)
 - 1. January of 2014 – state started a drought task force where governor's office works with **Cal OES** (coordination of responses)
 - a. Governor declared state of emergency
 - b. Executive Order in place that addressed impacts via emergency legislation and gave \$700M to address emergency drinking water, conservation efforts, unemployment impacted residents, etc.
 - i. 80% focus on Tulare basin = biggest demand for emergency assistance (housing, water, food → \$3M funds already dispensed for these efforts)
 - c. 52 various municipalities, tribes, special jurisdictions have declared emergencies as well
 - d. Drought Task Force – works with UC Davis who performed an economic impact study (agricultural impact mainly) – released July 2014 → \$1.5M anticipated loss in

crops + livestock/dairy loss + increased operation costs
(*pumping, etc.*) = \$2.2M economic loss

i. Drought causing unemployment – *Tulare County*
impacted significantly

ii. Meets every Thursday

e. Small wells are impacted (single home owners) but not
monitored due to lack of existing reporting system →
Problem = how do we assist them?

iii. Supply Report - *Bill Croyle*, Drought Management - **California**

Department of Water Resources

1. Works with CAL OES to address drought issues

2. Current conditions (water supply): *Serious Threat* → Entered
into 4th year of drought emergency (state wide)

a. Different, localized conditions throughout the state –
Agriculture was impacted in large part

i. Means switch to groundwater which impacts
groundwater availability/access and drives up
farming costs (and then crop costs)

ii. Rain in Feb/March of 2014 helped (especially in
critical watershed)

1. Some increased supply

2. Scaled back requests for modified delta
standards (Real time water operations team
handled this delta analysis → met several
times a week to address challenged and
involved several regulatory agencies)

3. Limited Operational flexibility
4. Water Transfers
- iii. Federal deliveries were restricted (historic low levels)
- iv. 100 key reservoirs throughout the state are at low levels (all losing water to meet public safety assistance needs):
 1. Shasta: 33% Avg.
 2. Oroville: 34% Avg.
 3. Folsom – 40% Avg.
 4. San Luis – 20% Avg.
- v. Ground Water – As surface water supplies run dry (especially in agricultural environments), then people switch to ground water (last 2 years – *110 feet draw down experienced*)
 1. CA DWR also having people monitor these levels more than traditionally done

b. Possible Drought Actions for 2015:

- i. Reduced Project Deliveries
- ii. Modified Delta Flow/Salinity Standards
- iii. State Water Board Curtailments
- iv. Drought Barrier Installation (one or more)
- v. Mandatory conservation
- vi. Increased ground water Use
- vii. Increased oversight on ground water use
- viii. Increased mutual aid

- ix. Increased real-time data and information
- x. Address communication to public → People believed El Nino type storms were coming, and thus increased water use, but storms never came (need to focus on alerting public to constant need to conserve)

iv. Water Board Proposals *Max Gomberg*, Climate Change Advisor,
California State Water Resources Control Board

1. Drought issues are tied into many efforts regarding climate changes (monitoring and planning for future changes like more frequent droughts) → keep this link in context
2. CA SWRCB – Monitors conservation efforts and adherence to regulations within urban Jx
 - a. Developed a resolution concerning hydro-electric utilities and how they are specifically impacted/regulated
 - b. Conservation incentives + partnerships as part of water action plan (coordination of water-energy efficiency programs – *i.e. storm water use*)
 - i. Some Jx don't have proper metering – need to get them up to date + advanced metering technology is increasing + recycled water supply (\$ and policy development being targeted towards this source)
 - ii. 440 larger utilities that serve 90% of CA's urban population and many smaller utilities (no uniform regulatory schedule like energy) – A, B, C and D categories conservation regulations

1. Smaller utilities don't have statute enforced
- c. Emergency Regulations (for potable water):
 - i. Application of water to sidewalks and driveways for washing
 - ii. Water of outdoor landscapes that cause runoff
 - iii. Using a hose without a shut-off nozzle to wash car
 - iv. Using water in a fountain decorative water feature (unless recirculated)
 - v. Enforcement:
 1. Can be done by local law enforcement or water utilities if they have employees authorized to issue citations
 2. Tracking impact of these regulations is key (mandatory monthly reporting now instead of voluntary to allow tracking)
- v. Data on Water IOU Consumption and Conservation
- vi. *Jack Hawks*, Executive Director, **California Water Association**
 1. Water Utility Companies conservation efforts
 - a. PUC Resolution W-5000 → will require utilities to notify customers of mandatory restrictions on water uses
 - i. Rule 14.1 – Voluntary conservation plan (approx.. 19 prohibited water uses) + Schedule 14.1 (mandatory rationing)
 - ii. Water IOU Production statistics (2013 vs. 2014):
 1. Even companies that show slight decrease do not alleviate any drought concerns

2. Jan-Apr numbers (before Rule 14.1) show less decrease in water consumption than post April stats that show downward trend in use

vii. Commissioner Sandoval Comments:

1. Sacramento has shown largest decreases and has served as model for area in conservation efforts

c. Panel on Agricultural, Commercial/Industrial Water-Energy Nexus & The Drought

- i. Moderator - *Robert Tse*, Regional Rural Economic, Broadband, Ag Tech Development Strategies, SDACA- Rural Development

1. CA = largest Ag producing state (\$44.7B economy) → so the drought is a severely disruptive event with huge economic impacts

- a. **UC Davis study** - \$810M crop loss, \$203M livestock loss, \$454M pumping costs to obtain ground water (total of \$2.2B loss due to drought in Ag industry)

- i. 62% increase in ground water pumping

- ii. *David Zoldoske*, Ed.D. Director, Center for Irrigation Technology, CSU Fresno and *Peter Canessa*, Agricultural Engineer, Program Manager, Advanced Pumping Efficiency Program, CSU Fresno

1. Hydraulic Testing Facility

- a. Many manufacturers use their data in their literature
- b. Education – how to increase efficiency in the field
- c. Program Design and Management – in 2001, CA Energy Commission contracted with Center for Irrigation Tech for \$12M contract to reduce energy use in Ag sector

- d. Irrigation scheduling website (free to users) – available to Ag owners and large scale private land-owners as well
- 2. Technical Presentation: Pump Inefficiency - Pumps start to wear or operate outside of its design conditions:
 - a. Lift increases (getting water from deeper underground means less efficiency) → impacts flow rate negatively
 - b. Working with PG&E
 - i. Cash incentive for retrofitting wells
 - ii. Going from 40% to 60% efficiency after retrofitting of pumps (*about 1/3 of energy bill is trimmed*)
 - iii. 45 evaluations over summer
 - 1. Barriers:
 - a. Costly skillsets (need more training/education) - \$1500-2000 for a hydraulic unit vs a pump test
 - b. Only have 12 testers working right now (used to have approx. 40 testers in early part of the decade)
 - c. Closed loop water management system (bottom-line measurement of soil moisture to close the loop → helps determine if estimates are wrong of if irrigation system is inadequate or failing) – REAL TIME INFO is available and CPUC funds can be used to

implement this (will end up in real savings)

- d. Meta-barrier: Education and audits to make technology useful (how do you justify budget when you have such hard time verifying water savings or energy savings in kWh?)

c. Irrigation efficiency

i. Good hardware → Well-designed system that:

1. Has high potential distribution uniformity
2. Provides easy control of irrigations
3. Minimizes pressure

ii. Good management

1. Know how much/when crop needs water
2. Know how much water has been pumped (metering)
3. Monitor system performance and adjust (good equip only goes so far → need to maximize irrigation scheduling for efficiency and savings)

iii. *Julien Gervreau*, Senior Sustainability Manager, Jackson Family Wines

1. Wine Industry Water Conservation and Reuse – Jackson Family focused in CA and OR (all vineyards are certified sustainable via two certification programs)

- a. 100% offset of company-wide electricity emissions through purchase of renewable energy certificate purchases

- b.** Formula for success for monitoring and reducing water/energy usage:
 - i.** Baseline water usage - understanding main sources (wells typically) and uses for water + assigning a cost/gallon (financial impetus)
 - ii.** Enact conservation measures – look at methods and technologies for reusing/conserving
 - iii.** Implement reuse technologies
 - iv.** Encourage behavior change - incentivize employees
→ this social aspect is key
- c.** CA sustainable winegrowing alliance:
 - i.** Online tool specific to winegrowers, but can be used by other industries as well:
<http://www.sustainablewinegrowing.org/selfassessment.php>
 - ii.** Allows JF Wineries to come up with 3 cents/gallon bottom-line cost – allows calculations of costs over various processes during winemaking process
 - 1.** Flow-meters – proper monitoring
 - 2.** Using squeegees to sweep grapes off floor instead of using hose (use of high-pressure nozzles as well)
 - 3.** HVAC setting optimizations (cooling towers use less energy to cool)
 - 4.** Plumbing cooling towers for reuse is potential future method of reducing usage

5. Recycling of water when cleaning out tanks via caustic cleaners to balance pH (saves 100-150 gallons using this method)
 6. “Pig system” – use a small nerf-football type object and pressurized nitrogen
 7. Roof-water capture for irrigation purposes (applied for grant to install technology)
 8. Barrel wash water recycling units – reuses water 3x before sending to the drain (automated barrel lines) → developed by JF Wineries in Monterey location but being rolled out in their other locations
 - a. Hot water used to wash barrels but cost savings are significant (payback period is less than 3 years)
 9. “Sap” flow measuring has allowed for optimal watering levels (over-watering is actually detrimental to wines) and in turn, has reduced water use by 50% and increased wine quality
- iv. *Olivier Jerphagnon, Founder, PowWow Energy, Inc.*
1. Startup company – Data mining (but do not deal with hardware)
 - a. **So far their data sharing has yielded what they believe is 5% savings**
 2. Opportunities

- a. Dramatic decrease of data (this data has been decreasing by 40% every year thanks to communications technologies improving)
- b. Saving transportation costs for water saves energy and in turn, reduces water use (Cyclic)
- c. Working with utilities will help accelerate innovation since it will increase data availability

3. Barriers

- a. Dichotomy: between what end users need and what goals the state/fed programs are (they need to be in line with each other and private companies can help do this)
 - i. Disparity of price signals across the state (energy intensity related)
 - ii. Privacy issues (like with education data)
- b. More detailed data required for aggregated data related to every aspect of Ag processes means more costs (SCADA costs more than green button data)
- c. Need a direct connection with growers
- d. Water-energy nexus (takes water to make energy and takes energy to move water → moving water from larger distances is not sustainable)
 - i. People are drilling deeper, and this is the wrong direction to go in (*i.e. areas like Paso Robles/San Diego where they drill up to 1500 feet*)
- e. How to count savings

- i. Current programs use calculators that assume 1 to 1 replacement (*i.e. low pressure nozzle, drip irrigations, etc.*) but it is different for savings associated w/human behavior
- v. *Dawn Welch*, Director of Commercial and Industrial Services, SDG&E
 - 1. Water-energy nexus is critical to the approach of conservation based on the interdependency/cyclic nature
 - 2. Look at users and try to target chances to save energy or water → we need to incentivize the embedded energy in the water (only for the water use or specific energy), but if a customer reduces energy use by using less water, this should be rewarded
 - 3. Partnerships and Outreach:
 - a. Innovation: “Living Wall” – sets stage with customers to show them how to be sustainable, but still be aesthetically pleasing/beautiful
 - i. SC Gas Co. energy resource center has drought tolerant landscaping → reduced water use at facilities for landscaping by 75% (SDG&E has done the same) = significant opportunity
 - b. Partnerships:
 - i. Water agencies (in San Diego county, there are 24) need to be worked with in order to develop sustainability plans for commercial customers, even mid-sized customers (water and energy is addressed that way)

- ii. Multi-family homes – (partnership w/LADWP) – SCG can reach these locations but also brings to bear water saving opportunities
 - iii. Think-tank Collaborative (April 2015): energy company can provide input on how water utility company can reduce costs energy wise (helps everyone) → reducing energy intensity by examining energy infrastructure
 - c. Rebate/Incentive Programs – gets users to adopt new technologies and be more efficient
 - i. Water: pumps (variable frequency drives as well)
 - ii. Combined water/energy (reduced water output and reduced energy need with less pressure)
 - d. Water treatment plants: Can use biogas from digesters to fuel cogen plants during peak energy times
4. Future Opportunities:
- a. Electricity Grid: certain areas might be able to be adjusted to see how water is operated to see if water movement can be matched with circuits that are peaking (pilot programs might be helpful to determine feasibility and effectiveness)
 - b. Combined dashboard – that shows water use and energy use (real-time data) → this would help savings, increase visibility, and show the nexus between water and energy savings
 - c. Managing time of use between Ag sector and residential (Ag users might wait to pump until after peak hours, but

then when residential users come home, they might use more energy concurrently with Ag water pumping)

vi. Commissioner Sandoval/Florio comments:

1. **Sandoval:** Ag uses 80% of water so we cannot address the drought w/o the engagement of the Ag sector (thus why this panel was allotted so much time)
2. Communications barriers (central valley):
 - a. *Julien* – did not have actual info/data about this, but suggested that CPUC help facilitate infrastructure that will allow Ag sector to optimize their operations and reduce costs
3. **Florio:** Co-optimization is what seems to be key (water and energy need to work together and make use of each other's data – sharing of information will lead to exciting prospects)
4. **Data:** *Robert Tse* – we need to take advantage of “hackers” (“Save Every Drop” hackathon) in the area to see how we can identify problems and make an app that will solve problem (allow Ag users to have real-time data that is usable and reliable)
 - a. Remote sensing equipment requires wireless broadband access in the fields (this is key so rural areas need to be updated)

d. Panel on Residential Water-Energy Nexus & the Drought

- i. Moderator - *Robert Castaneda*, Director of Market Development, **Proteus**; Member of CPUC Low Income Oversight Board

1. 44 year old human services provider – Proteus delivers critical services and HQ is in Tulare, CA (6 counties are served) → Serves ratepayers through every investor-owned utility in CA
 - a. Workforce education/training programs that take disadvantaged communities and train them to perform sustainable work
 - b. Embedded water and energy pilot programs (March of 2011)
 - i. Talked about pumping stations, low-flow toilets, and other initiatives
 - ii. Final report stated that stopping leaks makes huge impact
 - iii. We have large number of staff members who can go out into field to do assessments at customers' residences (low-flow toilets and so on are costly for low-income families, but testing and repairing leaks is often much cheaper) → LEAK DETECTION IS KEY
 1. Can examine water meters to do this cheaply
- ii. *Peter Yolles* CEO, **WaterSmart** – Expert in behavioral water efficiency and motivating change
 1. Software – changes the way people think about water use through computer analytics and behavioral analysis (using Cloud networks)
 - a. Founded in 2009 (Winner of 2010 Imagine H2O competition)

- b. Operates with 25 water utilities in 4 states and process water meter data over 1% of all water consumers in US
2. Behavioral Water Efficiency
- a. Social norm-based changes → look at water consumption and compare to similar homes with similar attributes
 - b. Other programs such as diet or smoking related issues show that feature sets will also work to reduce water use (personalization)
 - c. Emergency Drought Regulations
 - i. Requirements and Resolutions
 - 1. 9th Resolution – state board commends water utilities for allowing users to compare water rates to other users
 - 2. 12th Resolution – encourage new technologies that reduce water usage through timely water behavior data use
 - d. Creating user change – use real estate data, customer data, weather data and other sources to tailor data for each household (home water reports and online/mobile device portal access)
 - i. Can see progress of water savings through behavior changes
 - ii. Interface for smart meters (hourly basis for data) and provide users with real-time data/warnings to mobile devices

- iii. Hot water and energy consumption (data for each type of end use) can allow consumers to determine where to save the most
- iv. Research shows average of **5% reduction in water usage**

3. Recommendations to CPUC

- a. CPUC should encourage conservation by improving cost recovery for behavioral water efficiency programs (like they do for other programs)
- b. Opportunity for water utilities to report on water-based energy consumption data (allows independent researchers to provide useful benchmarking data)
- c. Water programs need to be brought up to same level as energy programs (as the 2005 and 2010 CPUC Water Plans indicate should be the case)

iii. *Charles Bohlig*, Supervisor of Water Conservation, **East Bay Municipal Utility District**

- 1. Getting information to customers is key avenue to addressing water-energy nexus issues
- 2. Most water utilities only take 6 meter readings per year – not enough information
 - a. Might not find out about a leak for two months – huge waste of water
- 3. Current issue is “demand hardening” with traditional methods
 - a. About 70% of market uses low-flow toilets (based on law requirements) so getting last remaining % of market on

board is more costly and difficult (why incentivize something that is required anyway? → because of the drought!)

4. EBMUD Outdoor Bundles Program

- a. Incentives: Turf removal, high efficiency nozzles, drip irrigations, ET controllers, sub-meters, pressure regulators
- b. Up to \$2500 for incentive for single family household and \$20,000 for commercial customers

5. Data Gathering (Water Budgets)

- a. 380,000 customers but 25,000 are single-family residential
Combination of a user information database and data from county parcel records (house information), CIMIS data that uses zip code based data, and so on helps reduce use
 - i. Through budget program, city is down to 67% of ET (golf course is down to 59% of ET)
 - ii. Residential application is in pilot phase (uses census data to track number of people per household) → Average of 50 gallons/day per person (guideline usage numbers might change depending on drought conditions in the future)

iv. *Morrice Blackwell*, New Product Sales and Market Development Manager, **Badger Meter**

- 1. Founded in 1905 – specialize in flow measuring equipment → importance of meter is focus of drought conservation efforts (to supply utilities with data they need to effectively monitor and decrease usage)

- a. Traditional networks – utilities do not have knowledge required to manage radio networks (move to wireless network will aid in this since it uses the already in place wireless network)
- b. Data to end user and utilities together is how to maximize savings (overlays will help – *i.e. comparing temperatures with water usage spikes*)
- c. Consumer portal – engaging and empowering user will allow them to understand how much they use and determine how to reduce usage
 - i. Future of industry is moving towards getting closer to customers (smart phone apps, etc.) → allows comparisons with other nearby/similar users
 - 1. Smart-phone app allows customer to monitor real-time usage and compare usage rated over long period of time by collecting data
 - 2. App can provide safety and usage notices in real time and alert customers to usage they might not be aware of (*i.e. irrigation system being used when customer is unaware*)
- d. Utility Issues (that CPUC should consider):
 - i. Customer buy-ins for conservation efforts
 - ii. Not having the tools necessary to effectively engage the customer
 - iii. Rate case and cost justification of AMR/AMI systems is very difficult b/c of soft dollar effects

(hard to quantify hard dollar savings at this time – something utilities struggle with)

v. *Kevin Jefferson*, Director of Research and Technology, **Urban Releaf**

1. Primary Goal of Urban Releaf (based in Oakland, CA) is to plant more trees (urban forestation)

a. Care for trees or other issues (debris/leaves) is a hurdle because initial planting of trees is favored, but subsequent by-products are not wanted at times

b. **Goal** – Increasing tree canopy to 35%

c. Large advocate for **SB 535** – Greenhouse Gas funds set aside for low-income communities (base-lined by EPA → CalEnviroScreen Map – highlights the hot spots in CA that includes almost the entire East Bay, but only one little block in SF)

i. Map doesn't reflect Hunter's Point port area (in draft form at the moment) → we need to make sure these trouble areas are reflected on the map

1. SF tree canopy is approx. 20%

2. Oakland is in "the teens" in regards to %

a. Some areas inland are only 2-3% in Oakland (inner-city areas)

ii. Create partnerships with CA EPA and local schools/public works departments – budgets for environmental services for cities is far too low

- iii. Need to use creative ways to use recycled water and utilizing labor (involving children and those in the criminal system to plant trees)
 - 1. Recycled oil for diesel trucks to lower footprint of transportation of trees from central valley (drought conditions means trees are more expensive)
 - 2. Use recycled water and effective, low-cost labor is key financially
- vi. *Kevin Shore*, Commercial and Industrial Segment Manager, **SoCalGas**
 - 1. Alignment of goals with water-energy nexus and goals of SCG
 - a. Water and energy savings together in one product can make it more appealing to customers and implement utilization
 - b. SCG reaches out to its own staff and stakeholders to implement actions in the communities since they typically live in the service areas
 - c. Drought Response Team (collaborate with other organizations and utilities to develop a plan to support efforts for energy efficiency and water reductions)
 - i. Increase awareness by using proper channels (energy saving and water saving tips provided to customers)
 - ii. Hot water is key → low flow shower heads, HE clothes washers, kitchen and bathroom aerators, thermostat demand valves

1. Plans use - Energy savings plans, low-income plans, multi-family plans, direct-install programs, mobile-home programs, home-upgrade programs, education/outreach programs
 2. Leak repair and landscaping is another focus for customers
- iii. Advanced meters (need more work to add infrastructure)
1. Current AMI meter customers are provided data to enable them to change their usage
 2. Outreach to customers: Website, Print, Email, Social Media, Radio/TV spots, collocation with local governments and water utilities
 - a. Works with LADWP – helps make value statement to customers (better sell to customers once they realize dual impact of savings) + reduces cost of programs
 - i. LADWP drop-ships low-flow hose bibs to customers to reduce water usage
 - b. Leak detection and direct installs help effectiveness of programs as well (especially in multi-family residences)
- vii. *Danilo Sanchez* CPUC, **Office of Rate Payer Advocates**

1. ORA is mandated to achieve lowest possible rate consistent with safe and reliable service
2. Water Action Plan of 2005 – ORA started to work with utilities to encourage efficient water use (CPUC had plan to make water utility programs as robust as energy utility programs)
 - a. Established budgets and conservation programs for water utilities
 - i. Cost of program to customers was key consideration
 - ii. 2007-2008 - ORA adopted the water block increases to encourage high water users to use less water
 - b. Public participations hearings:
 - i. Allows ORA to hear complaints and concerns from citizens (esp. low-income customers)
 - ii. Allows ORA to monitor effectiveness and feedback from utility companies

viii. Commissioner Sandoval comments

1. One issue is that some customers that have taken steps to conserve area adrift and do not know what steps to take next
2. Long-term goals will be key as drought continues
 - a. Water audits are one item to be focused on
 - b. Delay – what can we do to cause more immediate action in residential sector (sweet spot for conservation)
 - i. Assessors should collect data and that data should be moved onto utility companies and used to engage customers

- [illegible]

- a. Pump testing and repair – targeted outreach to central valley Ag customers
 - b. Low-income side: bring to communities an awareness of the various programs so they gain access to such incentives
 - c. Research:
 - i. Biological waste water treatment, Soil moisture sensors, new products for leak detection, home water report pilots
 - ii. Ag sector – need to develop programs to leverage research so new programs can be implemented
 - iii. *Veronica Gutierrez*, Vice President Local Public Affairs, SCE
 - 1. Water-Energy Nexus Pilot (with 5 cities)
 - a. Testing for water pressure and leaks (thus far 60% of over 500 miles of pipes have been tested yielding discovery 30 leaks → would have been 40 Million gallons of water if they had not been detected and energy savings are being calculated)
 - b. Emergency Response planning – facilitating such planning with other agencies
 - c. Working with Tulare (task force) to make sure they can use electric pumps to access water for varying needs (Ag, trees, etc.)
 - d. Bishop Creek Water Assoc – under a 1933 water decree – residents want more water rights (especially with their shallow wells)

- e. **Kern River** – US Army Core of Engineers is fixing the damn issues but it will require new road so collaborating with Cal-trans (hurdles with federal govt)
 - f. Helping city of Banning work with US Forest Service over water access rights so that an agreement can be reached
 - 2. Pushing energy south to north has created new challenges on a system where energy flow is traditionally north to south (from hydro-plants down to users)
 - iv. *Ben Chou*, Policy Analyst, Water Program, **NRDC**
 - 1. International Nonprofit Org – maintain interests for customers to have access to clean and safe water
 - 2. Reaching community is important:
 - a. PSAs like those done with Conan O’Brien (working with CA Save the Water campaign)
 - b. Report in June – untapped potential of CA water supply by using storm water capture and efficient reuse (can save up to 14 Million acre-feet of water, which is more water than is used in CA by every city, each year)
 - c. HE clothes washers are a great tool to conserve
 - 3. Nexus
 - a. Appliances use high levels of water and energy (energy used to heat water, agitate clothes, etc. and remove moisture)
 - b. Energy needed to treat and transport water and then collect the used water
 - c. Energy savings of HE appliances (clothes washers)

- i. Old style washers are 20% of a household's usage on average and a new HE washer can provide 70% savings compared to traditional units (top-lid style)
 - 1. Energy savings of 1600 kw-hrs per unit
 - 2. Households save on water and energy bills
 - ii. Utility companies need to maximize these savings by increasing awareness + we need to reach out to utilities that aren't implementing such rebates
 - iii. Low-income customers (scale up offerings)
 - iv. Old washers need to be recycled (approx. 800,000 a year) instead of being given away or sold (secondary market use) → a pickup/collection program would enable this
- v. *Rory Cox, Analyst, CPUC, Energy Division*
 - 1. Lead analyst for marketing programs in Energy Division
 - 2. Case study in inter-agency cooperation between Energy Division and other departments
 - a. December 2013 Statewide Marketing Decision (D.13-12-03B) – authorized \$42 Million campaign – “Energy Upgrade CA”
 - i. Campaign a marketing platform for all demand side activities (energy efficiency, demand response, Distributed Generation, etc.)
 - ii. Close cooperation w/energy division, business community outreach, and news and public information divisions

iii. Governor mandated water messaging into the program

1. Research was done to what methods would yield best results with customers
2. Internet Display Banner ads were produced (i.e. dishwasher use and brushing teeth with water running - to help customers understand water/energy nexus) + Commercial with state bear
3. Productive exchange of information to Governor's office so he was aware of what utilities were doing and so forth

vi. *Patrick Hoglund, CPUC, Energy Division*

1. Working on cost-effectiveness calculator that is being produce (should be complete by end of year) → will allow analysis of cost-effective programs and in turn, implementing such programs
2. Interagency communication maximizes awareness and also efficiency of proposals by different divisions (expectation that we expect utilities to request funding for energy use programs)

vii. *Cynthia Mitchell, The Utility Reform Network (TURN)*

1. **TURN** is in support of ORA's direction – holding the course in finalizing the cost-effectiveness methodology and facilitating partnerships (CPUC's best and most immediate way to address the drought)
2. 2007 Proceedings on embedded energy in water - Commission looked at cross-subsidies in 3 areas:

- a. Subsidies b/w water and energy rate payers
- b. Subsidies b/w IOUs (PG&E ratepayers should not be paying water embedded energy water savings from southern part of the state)
- c. IOU expenditures for embedded energy savings that are associated with wholesale markets (*i.e. statewide water project uses 60% of energy to convey water but it is wholesale energy*)
 - i. Need to make sure when finalizing embedded energy model that we don't overstate these costs

viii. Michael Campbell, CPUC, Office of Rate-Payer Advocates, Program Manager

1. IOUs can work with publicly-owned utilities but they need guidance as to what to put in their filings
 - a. PRA proposed taking overall cost associated with a water utility and dividing it by their sales to come up with embedded cost of energy for that utility
2. If this is done as a rate-setting proceeding, programs will be implemented sooner since the utilities will have to modify their rates sooner
3. Embedded cost of energy and water can be different from time to time and place to place)
 - a. Commission cannot set tier or block levels
 - b. Different technologies have varied costs so take this into account with each utility company and their resources

- c. Companies that have water and electric side (like LADWP) might not be “touched as much” by CPUC policies

ix. Commissioner Sandoval/Speaker comments:

1. Utilities should use ESA dollars to communicate effectively to customers about how to best address water-energy nexus savings (this decision was implemented directly by Comm. Sandoval but this sort of thought process should have been suggested by the various divisions within CPUC → “silo” type thinking is a hindrance so we need to break through this barrier and communicate more effectively)
2. This broad thinking needs to take place at CPUC and within utilities to better help most-impacted customers (use all tools possible)
3. CPUC has extended scoping deadline to allow for telecommunications companies to become involved in the nexus issues

f. Interagency Coordination to Address the Drought

- i. Moderator - *Lisa Beutler*, Executive Facilitator, **California Water Plan and Water Resources Group**, MWH Americas
- ii. *Jared Blumenfeld*, Regional Administrator, **U.S. Environmental Protection Agency**
 1. Appointed in 2009 by President Obama and has focused on coordinating efforts between various state and federal agencies as well as climate change and subsequent enforcement
 2. US EPA has given state of CA \$2 Billion since inception of Safe Drinking Water Act (stimulus money came in 2009 and Congress

required that we look at green infrastructure and how waste water facilities were running in terms of energy efficiency)

- a. 30-40% of city utility expenditures goes to waste water treatment and water distribution facilities
- b. Cities should be looking at how to make their waste water treatment plants energy producers
 - i. EBMUD is great example as they produce 130% of their energy needs
- c. Audits: EPA conducts energy audits of mainly waste water centers (38 cursory audits would save then approximately \$14 M dollars and \$10 Billion gallons of water a year and 80,000 MW-hrs)
- d. Leaks: Need to be addressed → easy to fix yet largely neglected or existence not known
 - i. In CA, results in 283 billion gallons of water being wasted every year and 2.5 billion kWh of wasted energy and \$2.5 billion of energy costs and 2.5 Billion pounds of GHG emissions
- e. Federal agencies:
 - i. Dept. of Defense (DOD) – they are working on tabulating savings of water-energy nexus programs
 - 1. 26% water savings with goal of 36% this year
 - ii. Federal buildings don't have water meters (only one at the front) → we need to get better infrastructure to measure use

- f. EPA conducts an Energy Star program for entire buildings as well as “Water Sense” program
 - i. Need more state-wide education (not leaving it up to individual jurisdictions)
 - 1. Low-flow showerheads or toilets
- iii. *Debbie Davis* Community and Rural Affairs Advisor, Office of Planning and Research (OPR), Governor Brown's Office
 - 1. Duration of drought is unknown → we need to respond in light of this as it impacts everyone
 - 2. We have water systems in the state that are in jeopardy of losing their supply (we have not gotten to the point where any system has been unable to provide water, but there are domestic wells that cannot supply water to the tap in residences)
 - a. Swamp coolers in certain rural areas also turn this into a heat/comfort/safety issue
 - 3. Biggest challenge is how to get out of silo-type thinking that is a hindrance to solving the drought problems (across all levels of agencies and private corporations)
 - a. Debbie’s suggestion: look at this issue from customer’s perspective (end user) → what is it that makes sense to the user
 - i. Use less complicated or fragmented data and focus on the actual needs and interests of the customers (*i.e. not where the funding for assistance programs came from but focusing on making them aware that it exists*)

- ii. Flexibility is important within agencies (different states and cities/counties have different needs, challenges, and resources so how do we get a product/program that works for everyone)

iv. *Diana Brooks, California Department of Water Resources*

1. Large need for customer information → way to achieve this is to integrate large industries such as water, energy, and telecom to enable emerging technologies to be implemented and effective
2. Short term goals: Behavioral changes that were started by the Governor's 20% use reduction requirement (less lawn watering, etc.)
3. Long term goals:
 - a. SBX 7.7 legislation – called in 20% reduction in per capita water use by 2020 (DWR is working on this)
 - i. Important goal since it brings in new technologies and infrastructure
 - b. CA Water Plan – Water is the lifeblood of the state
 - i. Complex water resources system is in crisis
 - ii. Diverse portfolio approach his required to address challenges
 - iii. Solution requires integrated water management, government agency alignment and investment in innovations and infrastructure
 - iv. Moving from plans to actions → planning for reliability and resilience (all accomplished by integrated and cooperative actions)

- v. Goals: reduce demand for water, increase conservation and water use efficiency
 - 1. Track/promote 20% by 2020 compliance
 - 2. Reduce outdoor water use (40-50% of urban water use so large savings potential) and retrofit indoor fixture, fix leaks, support agricultural efficiency improvements
- vi. Co-sponsored a landscape symposium (CA urban water conservation council, DWR, Dept. of pesticides regulation, and other agencies)
 - 1. Report is being prepared (400 attended)
 - 2. Need to change social attitudes towards traditional landscaping
- vii. Water-Energy Grant Program (\$19 Million project) – applications will be due by December 2015
 - 1. Eligible grant recipients
 - a. Local agencies, joint power authorities and non-profits
 - 2. Eligible Project
 - a. Residential, commercial, or institutional water efficiency programs or projects
 - 3. Projects must do all of the following:
 - a. Reduce greenhouse emissions
 - b. Reduce water use
 - c. Reduce energy use

- viii. CIMIS – California Irrigation Management Info System (also run by DWR)
 - 1. 146 automated weather stations throughout state
 - 2. CIMIS provides hourly, daily, and monthly evapotranspiration and weather data for scheduling, water budgets and other applications
 - 3. 49,000 users
- ix. UC Davis – proposing a drought study with a control group in regards of instant messaging/smart meter savings
- x. Diversify Water Supply Portfolio
 - 1. We need to transition from dependence on surface and ground water to more diverse products (desalination for example)
- xi. Sustainable Funding Needed
 - 1. Need to close funding gaps
 - 2. Long-term water resource monitoring, management and planning require a sustainable funding source
 - 3. Reliance on water bonds is unsustainable
 - 4. Recognizing multiple benefits of integrated water/energy/communications projects is key
 - 5. Public/private partnerships will be more important in future

v. *Bill Croyle*, California Department of Water Resources

1. We should be thinking about critical water shortage (we could have at various jurisdictional levels at any time → natural disasters could amplify our already dire conditions or severely damage major infrastructure)
 - a. Emergency management and coordination (primarily data and communication) is key for effective outreach
 - b. Getting real-time data from those who aren't connected to private/public water systems is also important (all this info needs to get to emergency managers)
 - c. Drought Task Force (out in the field) → obtaining data via "strike teams" who work with locals to address problems by providing relief if possible or mitigating impact of their problems
 - i. Smaller work-groups (agricultural, small business, etc.)
 - ii. Providing staff between agencies can also help with coordinated efforts and "plugging holes" in mutual aid
 - d. CIMIS is a great example of how to collect and share information between agencies and most importantly with the public
 - i. Built relationships and enabled most effective use of collected data

- e. Focus on ground-water legislation (we need to determine how to use data we have and determine where we need more data)
 - i. We need to do this to get a water balance in CA (storm water vents and so on)
 - ii. Public safety factor should be considered when determining whether cost of some systems is worth it
- f. We need to broaden our information management systems and take advantage of existing infrastructure and share data across the internet (reduces cost of programs) → need to have communication between industries for this
- g. Sustainable funding will help deploy technology, audit systems and enforce regulations, which we need to do
- vi. *Kelley Gage*, Principal Water Resources Specialist, **San Diego County Water Authority**
 - 1. San Diego presents a unique challenge given they are at the end of the water distribution pipeline
 - a. 20% of water comes from state water project (delta), 63% from Colorado River and only 17% from local supplies
 - 2. SDCWA is a wholesale water provider and services approximately 97% of the county (3.1 million people)
 - a. 35 board directors
 - b. Service area overlaps with SDGE so a lot of opportunity for joint-programs (they have successfully partnered in the past)

3. Strategies to Provide Continued Supply Reliability

- a.** Employ resource strategies unique to local conditions
- b.** No single resource strategy can manage all uncertainties
- c.** Multi-faceted approach required:

- i.** Supply diversification

- 1.** Using information from last drought in early 1990s
 - 2.** Diversification is costly (cost per acre-foot of water is severely higher today) but conservation can offset this (760,000 people more in 2013 vs 1991 but same overall use so that was made possible by conservation)

- ii.** Conservation

- iii.** New supplies

- 1.** Desalination
 - 2.** Recycle water

- iv.** Infrastructure improvements

- 1.** Regional storage
 - 2.** Dam raise (raised it 117 feet to increase storage substantially)
 - a.** Large scale hydro-electric storage that allows zero-carbon emission energy from wind farms to use for SDGE's peak energy times

4. Utilities Working Together – look to previous successful partnership programs around the state for water-energy program expansion

a. In San Diego, partnership with SDGE has been successful

- i. 1991-2002: low-flow showerhead campaign (550K low-flow showerheads distributed)
- ii. Since 1994 – HE Clothes Washer Installation (100K residential HE washers installed)
- iii. 2008-2010 CPUC Pilot: HE toilets, landscape incentives, audits and retrofit incentives
- iv. 2010-2012 CPUC Pilot: No-cost energy efficient audits to the 24 water authority member agencies
- v. Detention Center retrofits
 1. Flush-timers for toilets (recreational flushing is used for communication but this wastes water)
 2. Yielded a 300 acre-feet of water a year at one facility (substantial savings)
 3. Planned for additional facilities

vi. Cross-marketing of Campaigns

1. Bill stuffers, social media

5. Inter-Agency Personal Challenges

- a. SDG&E Century Park turf replacement project (ripping out 115,000 square feet of turf being replaced with drought tolerant landscaping)

- b. Water Authority replaced 1,800 lightbulbs with HE bulbs, which results in savings of 40,00 kWh annually

6. Interim Actions

- a. Water Authority supports expansion of voluntary water-energy partnership programs
 - i. Local water and energy utilities need to agree on elements customized to their regions
 - ii. Commission to determine energy benefits and fund accordingly (no regrets for IOUs implementing programs)
 - iii. Local water agency boards to determine water benefits and appropriate funding levels

vii. General Comments:

- 1. Water Wise winery programs can be implemented in other sectors such as brewing or other industries (like in San Diego, micro-brew capital)
- 2. Waste water treatment facilities are an almost untouched sector with large potential of savings (largely untouched by solar implementation, and other technologies)
- 3. Capturing rainfall in a green fashion
- 4. Even though some jurisdictions are doing better than others, it is still a state-wide issue
- 5. Commissioner Sandoval
 - a. Market transformation and breaking through silos is key

- b. CPUC regulates 75% of electric rate payers but only 19% of water ratepayers (still largest single group of water ratepayers)
 - i. Need to cooperate at state and federal levels
 - ii. Need to change norms in society (landscaping is huge)
 - iii. Look beyond current crisis to implement permanent change

(END OF ATTACHMENT A)

ATTACHMENT B

Report on September 10, 2014 Communications-Water-Energy Nexus Workshop

Prepared by Commissioner Sandoval's Office

Background

This workshop was held by Commissioner Catherine J.K. Sandoval to discuss the Communications-Water-Energy nexus and how it relates to public safety. Panelists presented and discussed data collection and use, technological innovations and other issues related to water and energy efficiency and conservation in industry, irrigation, and home use. The workshop consisted of several panels and public comment. Video of the workshop in RealPlayer format can be found at:

CPUC Workshop - September 10, 2014 - Communications, Water/Energy Nexus Workshop:

http://archive.adminmonitor.com/cpuc/real/CPUC_WS091014-1.rm

http://archive.adminmonitor.com/cpuc/real/CPUC_WS091014-2.rm

The Agenda for the Workshop is provided here, along with a summary of primary themes and an outline of the workshop proceedings prepared by Commissioner Sandoval's Office.

Agenda

9:15-9:25 Welcome

9:25-10:30 Leak detection for water infrastructure and management on both sides of the meter & customer water management

Moderator: Steve St Marie, Policy Analyst, Policy and Planning Division, CPUC

Cody Coeckelenbergh, Regional Director, Lincus

Suzie Rose, Utilities Engineer, ORA

Bob Day, Director of Customer Service, San Jose Water Company

Tony Ndah, Senior Engineer, Santa Clara Valley Water District

10:30 - 11:45 Pumping, irrigation efficiency and water management through communications & information technology

Moderator: Kent Frame, Program Manager II, California Department of Water Resources

Jeff Shields, General Manager, South San Joaquin Irrigation District

Bob Gore, Senior Advisor, The Gualco Group, Inc.

Jim Anshutz, AG H2O

Siva Sethuraman, Senior Program Manager, PG&E

Calvin Rossi, Regional Manager, SCE

Kenny Watkins, Vice President, California Farm Bureau

Nancy Goddard, Demand Side Management Program Manager,
PacifiCorp

11:45 - 1:00 Lunch

1:00-2:05 Forest, public safety, water management, bio-fuels & water for hydro & other water needs

Moderator: Glenda Humiston, State Director, California Rural Development, U.S. Department of Agriculture

Ashley Conrad-Saydah, Deputy Secretary for Climate Policy CalEPA

Andrew McMillan, Manager, Northern Hydro Office, SCE

Robert Tse, Community Planning and Development Specialist, USDA-Rural Development

Alvin Thoma, Director, Power Generation, PG&E

2:05-3:30 Big Data, communications for water storage, management, transfer, satellite, meter aggregation, privacy

Moderator: Bill Johnston, CPUC

David Rosenheim, Executive Director, The Climate Registry

Jeff Campbell, Vice President, Government Affairs, Cisco

Jonathan Spalter, Chair, Mobile Futures

Lee Tien, Senior Staff Attorney , Electronic Frontier Foundation

Brian Farhi, Business Development, Nest

Steve Schmidt, Founder, Home Energy Analytics

Tim Hirou, Founder and CEO, Convergence Wireless

3:30-4:30 Enhancing communications & energy infrastructure to support water/energy nexus & management; aligning CPUC, state & federal programs

Moderator: Sue Sims, Executive Officer, California Water Commission

Honorable Cynthia Gomez, Governor Brown's Office of the Tribal Advisor

Joseph San Diego, Tribal Chairman, Hopland Band of the Pomo Indians

Celeste Cantu, General Manager, Santa Ana Watershed Project Authority

Barbara Ferris, Public Utilities Department General Manager, Hoopa Tribe

Cathy Emerson, Manager, Northeastern and Upstate CA Connect Regional
Broadband Consortia

4:30 - 4:45 Public Comment

4:45-5:00 Commissioner Comment

Major Themes and Questions

1. Water can be better managed by analyzing timely procured data about system, water use, and operations: moisture meters, irrigation system/standards/equipment all are systems that operate and could be optimized to ensure the appropriate amount of water and energy used in order to conserve resources and reduce costs. Advanced technologies require internet access or a communications network infrastructure of some type in order for the data to be timely created, collected, and analyzed for precise decision-making. Lacking broadband access/ internet access in the central valley farming areas, specifically on farmers' fields in 4 of 5 of California's top farm producing areas, prevents the implementation of advanced technologies to help optimize and manage water and energy.
 - A. Is it possible to optimize water and energy management without the use of data? How might the ability to create, collect, analyze data in the agricultural areas of the state of California help to optimize and conserve the State's water and energy resources?
2. The drought has changed the way that traditional water systems are used. Water system operations have changed, including the operation of hydro-electric plants and water storage. Dam management, for example, has been done traditionally based on the experience of managers. Data and technology, however, can increase the precision from which water and energy management decisions can be made. For example, the California Irrigation Management Information System is a successful data and analysis tool used in the area of evapotranspiration data.
 - A. What other types of tools could and should be developed and used for water systems management? Is broadband access a barrier to

implementation of tools to generate, collect and analyze data? What would the tools of the future look like, what data sets would they provide, what data sets could they use? Who would manage these tools, who might coordinate with these tools? Please explain. If the CPUC sponsored the creation of some applications, what could be helpful?

B. What types of tools or apps could help to address water and energy optimization in the agriculture sector, the single largest user of water? What types of leaks could be tackled in the agriculture sector? Would internet access be helpful to the creation, collection, analysis and use of data for decision making? How can this be accomplished?

3. Forest maintenance enables better water and energy management, fire safety and public safety. For example: the Rim Fire near Yosemite cost over 125M to fight and in property and economic losses. The current bark beetle infestation has killed many trees in the state leaving great areas of dead trees ready to burn. Fighting fires protects property, water infrastructure like at Hetch Hetchy, and energy infrastructure like the transmission infrastructure required to power the water infrastructure moving water all the way to the city of San Francisco.

A. How could GO 195 or enforcing CPUC rules about vegetation management be used or enhanced to better protect our water and infrastructure put at risk by fires? How might broadband deployment help to manage water better while fighting fires (ie dropping water at the right spot to more effectively put out the fire) especially in light of a lack of broadband access in fire danger territory?

4. Data on water and energy use and greenhouse gas emissions are important. Climate change impacts hydropower system operation, water level and flow

rates and safety for the public and wildlife. Water cycle data, water sensors can increase our understanding. Other areas of interest include soil moisture levels, soil fertilizer levels, pest problems, promote a better understanding of water and energy use – collecting, analyzing that data helps promote informed decisions.

- A. In developing greater data sets, how can the water and energy sector collaborate better with Green Button? Should there be Green Button for water data? How could Green Button Water integrate with green button data for electricity?
 - B. How do the privacy rules of Decision (D.) 11-07-056 apply? Are modifications required to accelerate combating the drought, efforts to promote success in Aliso canyon, detect and fix leaks, climate adaptation?
 - C. Water and energy use data creation, collection and analysis occur when communications infrastructure/ broadband access/ internet access are interoperable with Demand Response programs. How can the CPUC promote sophisticated, real time remote monitoring and control of water and energy systems? How to enable more cross industry system integration? Should the CPUC lead the pathway forward to create standards for cross industry system integration? How can increase connectivity, access communication networks, increase partnerships between industries, break silos and promote cooperation through data optimization?
5. Lacking communications infrastructure, the backbone physical infrastructure of the internet, can keep communities out of the modern economy. A good example is tribal communities living within the geographic boundaries of the State of California. Lack of broadband access has negative impacts on public

safety and heightened forest fire risks, safety risks for first responders, community members and animals. Communications enable collaboration with US forest service to reduce costs affiliated with forest fire fighting, water, and better air and water quality, greenhouse gas emissions reductions overall

A. How can the CPUC promote the enhancement of communications and energy infrastructure to support water and energy services optimization and management, and further align CPUC, state & federal programs?

6. Much of the conversation around leveraging water technology to expand existing supplies focused on how to increase on-site reuse in residential and CII buildings.

A. What are the regulatory and other barriers needed to pursue these untapped potential?

7. Inadequate broadband limits use of irrigation technologies. Inconsistent and weak broadband coverage limits successful use of promising irrigation technologies in California's more remote rural areas. Many farms don't have complete coverage, while service is weak, inconsistent, and lacking on others. As a result, farm employees don't have access to real-time data to inform their management actions. An aerial imaging technology company shared their challenge developing a customer base due to insufficient broadband coverage.

A. How can growers and farm staff working in the field receive more education on advanced techniques and advanced technologies? How can rural broadband, public safety networks, educational broadband and California Advanced Services Funding be leveraged and expanded into remote areas to provide agriculture the opportunity to optimize water and energy use? Can irrigation districts use their existing infrastructure to

provide broadband for their growers? What broadband technology workarounds can be developed so unserved and underserved territories can connect in coming months and years when broadband infrastructure is expanded. How can we specifically target broadband expansion into these areas?

Workshop Outline

a. Introduction

b. Leak detection for water infrastructure and management on both sides of the meter & customer water management

viii. Customer Side + Supplier Side

- ix. Cody K. - *Lincus* - Clients are CA electric utilities - Tasks include: Energy audits, Entire portfolio implementation & management, Software solutions - optimize processes (standardized audit tools that inventories entire buildings), Carbon management

1. Water Use Efficiency

- a. System Improvements - Infrastructure (entire system - *i.e.* pumps, pump interaction) → Optimize efficiency while maintaining safe, reliable water

i. Recycling operations

- ii. Hardware/ Appliances - pressure reducing technologies, low flush toilets, etc.

b. Behavioral Improvements

- i. Soil/ moisture sensors = optimized irrigation
- ii. Proper design and benchmarking of water systems
- iii. Satellite analysis - allows farmers to optimize water use (5% of farmers currently use) → can decrease water consumption by 13%
- iv. Reducing water pressure in systems means reducing water use at the plant level and reducing leaks

- c. Coordination between Water and Energy efficiency is “minimal”
 - i. Leak Detection – EPA estimated 16% of water lost through leaks (205,000 acre feet of water a year) → 60,000 miles of pipeline - \$36 Million total cost – water would no longer have to be treated, supplied and distributed – so savings of almost .5 Million kWh of energy (cheaper than energy efficiency programs on cost basis) → Same applies to urban water systems
- x. Susy Rose (Water Engineer) – **Office of Ratepayer Advocates (ORA)**
 - 1. Reducing Water Loss Due to Leaks
 - a. State initiatives = 20 % conservation and SB 1420 requires leak loss reporting within water plans submitted every 5 years
 - b. CPUC General Rate Cases (GRCs) for water investor owned utilities (IOUs) – 20% of urban waste customers and submit GRCs every 3 years (required to submit plans if non-revenue water exceeds 7%)
 - c. Standards: AWWA (American Water Works Association) – Best practice water audit method established – SB 1420 would be based on this method + California Urban Water Conservation Council also has best management practices like auditing

- i. Separating *real losses vs apparent losses*: Real losses = actual leaks vs. Apparent losses = meter inaccuracy, hydrants, and other unbilled consumption
- d. 4 Energy IOU Leak Loss Partnership Programs
 - i. Currently part of their energy efficiency budgets (all determined to be cost-effective – based on detection costs, NOT repairs)
 - ii. Current Challenges
 - 1. Cost Effectiveness – at outset of project, you don't know the number of leaks so hard to project & hard to target most cost-effective programs
 - 2. Reconciling partnership expectations
 - 3. IOUs fund detection only and utilities need to repair, so can reduce savings
 - iii. Opportunities
 - 1. Partnerships with agriculture + Customer-side targeted programs (harder to determine if repairs were made, but cheap repairs are available – *i.e. toilet leaks fixed by \$5 rubber flapper*)
 - 2. Technology advancements can increase leak detection cost and efficiency (challenge is that it hasn't been finely tuned at this point)
 - a. Text/Email notification for customers

- b. Utility side – instant notification from an automated water system

iv. Solutions:

- 1. Identify cost effective programs – CPUC needs to guide IOUs on how to prioritize programs and establish a methodology, set cost effectiveness standards, and establish partnerships between IOUs and water utilities

xi. Bob Day – **San Jose Water Co.** (customer of SCVD – see below):

1. Water Audits + Leaks

- a. 1 Million customers – largest IOU with a contiguous area
- b. 3% of meters read electronically and 6,000 meters read by mobile AMR (for large consumption customers)
- c. **Aquacue/Badger “Barnacle” – first AMI endpoint using cellular network** (real time water use info to utility + customer) – used for larger customers (multi-unit dwellings and businesses)
 - i. Used to find large leaks like in Mobile Home Park where the leak never surfaced under concrete patio (acoustical analysis was used)
 - ii. Allows interaction with and education of customer to reach solution and eliminates guessing

xii. Tony Enda – Sr. Engineer – **Santa Clara Water District**

- 1. Leak Detection – Unique approach in Santa Clara due to large facility

- a. 2 Million customers and 144 miles of pipeline (30"-144") + 10 dams
- b. Low rate of leak occurrence (1-2 per year)
- c. Visual Inspection and rehabilitation of 2 pipelines per year (5 year **Pipeline Rehab Program**) – cameras or walk-throughs to look for corrosion or cracks → *upgrades, replacement, internal repair, modifying failure prone pipeline* – broad solution range
- d. **Cathodic Protection System** – water is corrosive so monitors this natural reaction with pipes – started in 1980s – uses small dose electricity to reverse natural corrosive tendencies + better internal coatings
- e. Regular **aerial inspections** via helicopters – look for really green grass essentially
 - i. Supplemented with acoustical and Δ analysis (difference in water supplied vs used)
- f. **Water-Wise House Call Program** – surveyor goes out to homes and inspects appliances and hardware to look for leaks, etc. – free to customers

xiii. Additional Notes:

- 1. **President Picker** – Urged SJWC to look into implementing more AMR/smart meters since it helps with leak analysis and getting customers up and running again after outages/issues are resolved
- 2. **SCWD "SCADA" Network** – measures flow at various turnouts which works well to determine differential (5 meters/gallons

triggers alarm at the treatment plan and automatically means team is deployed to explore)

- a. Identifying leaks at distribution system requires lot of meter and sub-metering tied into SCADA system and hydraulic models (most cost effective method but does require infrastructure) → Customer Level: Identifies changes/patterns on user side
- b. Smart-meters – Incredibly expensive to renovate, so is this the best use of the ratepayer funds – need to do **cost/benefit analysis** to determine if that is the case (long-term benefits)

3. Determining Cost/Savings of Water – Difficult to determine this given the nature of water rights (IOUs) → Analyze cost based on water utility employee costs and other costs (finding new sources of water takes very large amount of \$, so

c. Pumping, irrigation efficiency and water management through communications & information technology

xiv. Jeff Shields – GM of San Joaquin Irrigation District (SJID)

- 1. Division 9 Pressurized Conveyance System Project:** Delivered 55 lbs of water pressure at farm-gate for 75 farms (3,800 square acres) – Used ground pumps
 - a. **Most farms today still use flood irrigation** (not efficient method)
 - b. **SBX 7-7** – requires volumetric metering and a 20% reduction in agricultural deliveries by 2020

- c. **SJID** – jumped aboard this project approx. 20 years ago by placing numerous radio towers and using 24” PVC piping with 55 turnouts (all controlled through radio frequency)
 - i. **Soil moisture monitors** – allows farms to monitor moisture levels 5’ underground
 - ii. **RTUs Utilize solar panels** – energy efficient
 - iii. Allows customers to control/order water via electronic devices and receive constant updates → SJID provides customers with historical weather/water related data to help them use water efficiently (automation)
 - iv. ***Results***: 25% less water consumed and 30% crop production increase → 55% reduced energy use and increased air quality without diesel pumps being utilized
- xv. Bob Gore – Senior Advisor of **The Gualco Group, Inc.**
 - 1. **By 2040** – We will need to increase food production by 40% without additional land utilizations
 - 2. **Delivery on demand is key to future water services for agricultural customers**
 - a. **Issue #1**: Lack of communication networks limits use of this new technology though (*i.e.* - central valley lacks such network capabilities)
 - b. **Issue #2**: Drought conversation = Reduced revenue for utilities – Means harder to implement new technologies
- xvi. Jim Anshutz – **AG H20**

1. Based in Fresno, CA (Fresno State University)
2. **Ag Imagination training programs**
3. **“Grange Network”** – Online site that allows farmers to listen to webinars and ascertain information regarding latest farming methods
4. **CA** – agriculture uses 80-85% of water, 10% of electrical power (75% of which used for irrigation pumps)
5. Conversion to drip irrigation:
 - a. Has increased in the last year by approx. 1 Million acres across CA
 - b. UC Davis study – found that most drip systems were only 70% uniform while goal is 90% (primarily based on lack of proper maintenance)
 - c. **Benefits of drip irrigation:** Increased crop benefits and yields (quality), less labor required (might increase energy use/acre if not properly used → old systems do not yield benefits)
 - i. **Lack of education** – manager of farms typically enlist uneducated laborers, which means inefficient operation and more energy used
6. **Main cause of inefficient water/energy use:** Has to do with duration and timing of irrigation (even flood irrigation)
 - a. **Too long duration** – water goes out and no benefit received
 - b. **Evaluate current systems** – Need to educate farmers so they realize they need to analyze their current systems and

pinpoint parts that need upgrading (newer systems run at less than **10 lbs of pressure = lower energy**)

- c. **Lack of standards** in drip irrigation systems – need to develop these standards to manufacturers can increase efficiency of systems
- d. **Better equipment** – Farm related equipment is typically lower quality than water utility equipment

xvii. Siva Sethuraman, Senior Program Manager PG&E

1. 19% water usage attributed to water-energy nexus

2. PG&E Programs:

- a. Industrial and Agricultural Codes & Standards
- b. Direct 3rd party and government partnerships
- c. Emerging programs Technologies:
 - i. 3 areas of focus: Pilot program with Cal State Fresno (45 site study regarding pump efficiency program so farmers can increase efficiency); Soil-moisture pilot program; Study with *Lincus*
- d. Rebate programs – uses engineering analysis to spur more efficient use from customers (*i.e. how is one field performing with respect to others, etc.*)
- e. New programs – exploring new methodologies and newer analytical techniques/hardware to see if better programs can be created (need to take advantage of emerging technologies)

- f. Marketing strategy – conversion rate is only 5% as far as farmers that adopt newer technology after a PG&E worker analyzes their pump efficiency

xviii. Calvin Rossi, Regional Manager at SCE

1. Based on central valley
2. Drought has cause need to vary operations at hydro-electric plants (traditionally power was moved north to south, but is now having to be moved south to north)
3. Two primary issues:
 - a. SCE's collaboration with local jurisdictions
 - i. Local county drought task forces participations – allowed SCE to identify chronic shortages and work to find innovative solutions such as SCE's conveyance systems
 - ii. Achieve minimum flow to customers
 - iii. Reached agreement to supply water to city of Bakersfield (SCE agreed to store some of unused water last year to ensure city had adequate water this summer) – *planning ahead prevents struggles*
 - iv. Expedite service connections and identify energy saving solutions (various groups within SCE such as *pump test group*)
 1. Increasing work to 7 days from traditional 5 days has allowed 50 more agricultural clients to obtain water for crops (driven by replacing diesel pumps with electric pumps based on

drought conditions since wells go deeper and
require more power to obtain water →
increases electricity demand)

b. Collaboration with Energy Utilities

- i. SCE worked with local jurisdiction with EE
partnerships → incentives to reduce water/energy
use
- ii. Conservation of water means energy saved on
supply side and also downstream

c. Coordinated efforts with Ag industry

- i. Wide range of agricultural rates so customers can
find most affordable rates
- ii. **Free pump tests** provided to Ag customers – identify
inefficient pumps (express upgrade incentive to
customers = more efficiency)
- iii. **Incentives:** Distribution uniformity and precision
irrigation installation incentives + high pressure
sprinkler retrofits + drip system incentives and
sprinkler retrofits

xix. Kenny Watkins, VP at **California Farm Bureau**

- 1. 78,000 farmer families represented
- 2. Increased cost of energy means some Ag irrigation systems that
require high pressure
- 3. **Moisture meters:** Analyzes readings, interprets weather
conditions and allows uniform irrigation

- a. Relies on GPS to align itself and can be monitored remotely with cellular network service
 - b. Quick access to information is key to stay competitive in ag market (network access is thus key) – reduces labor costs as well → Making sure wireless/cellular carriers are aware of this need and increase coverage in these Ag areas
 - i. Electric providers need to provide cleaner and more balanced energy (current three phase energy provided to users shortens lifespan of many types of equipment and lowers efficiency of waters – on Kenny's farm, pumps were only at 25% efficiency)
 - ii. Kenny's farm was 12 miles east of Stockton (carriers are dropping coverage)
- xx. Nancy Goddard, Demand-side Program Mgr at **PacificPower/PacificCorp**
- 1. **Small Utility Company:** 45K customers in CA (far northern part of the state), 1.8 million across total of 6 western states (however actually area/territory in CA is vast)
 - 2. **Irrigation efforts:**
 - a. Crops: Alfalfa, grass hay, barley, wheat, mint, potatoes
 - b. Irrigation systems: Wheel lines, pivots, hand lines and some drip (sourced from groundwater everywhere except for some locations near Tulare Lake where few canals are used)
 - c. **Energy savings results:** from irrigation sector = 586,000 kWh (in CA alone)

i. Observations from interactions with CA customers:

1. Scheduling is based on judgment and experience of dam managers
2. Very few customers have flow meters (need more technology) – some candidates could benefit from new technologies
3. Information shared via personal networks/neighbors (low-tech)

xxi. Kent Frame, DWR water-use efficiency branch

1. **CIMIS** (CA Irrigation Management Information System) – founded in 1982 (by 1985, 42 independent weather stations → Now 146 stations in both Ag and urban areas)
 - a. Automated system that compute data and then provide data hourly (processed in Sacramento and made available to public with no charge)
 - b. Reference evapotranspiration is the key statistic provided
 - c. **Spatial CIMIS** – filled in gaps between other stations (2 km grid throughout state)
 - i. Partnered with **NASA** regarding crop coefficient issue (to be used in conjunction with evapotranspiration data) → Algorithm developed where state-wide crop coefficients are provided based on spatial CIMIS (interfaced with Google Maps – field specific so aids irrigation scheduling)
 - d. Saves in labor/ fertilizer and irrigation costs (22-30% water use reduction are latest numbers)

xxii. Commissioner Florio comments:

1. With solar energy, sometimes ideal time of use states will be different than traditional time period (mid-afternoon might mean a surplus of energy making it a good time to pump) → Utilities should pursue studies in this area

xxiii. Commissioner Sandoval comments:

1. We cannot solve drought or address water-energy nexus without addressing agriculture (single largest user of water)

d. Forest, public safety, water management, bio-fuels & water for hydroelectric & other water needs

xxiv. Moderator: Glenda Huminston, State Director at USDA

1. **Focus of this panel:** The advancements that can help facilitate advancements to the water-energy nexus (better data and tools for regional planning as well as eco-system services and telecommunication network services)
 - a. How do we harness current state/federal programs in place
 - b. Increase forest activities that can reduce damage to energy transmission infrastructure and ability to provide 10-15% more water from northern watersheds
 - c. **Poor current state of CA's forests:** To just maintain our current, poor state in the forests, we need to treat 500,000 acres per year (we are only doing 10% of that – we need to **increase efforts**) – we need to better use funding

- i. Prior efforts to seek funding were unfortunately involving logging → seek out new revenue sources (biofuel)

xxv. *Ashley Conrad-Saydah*, Deputy Secretary for Climate Policy, **CalEPA**

- 1. Forests – protecting watershed means sequestering more water and a more permeable landscape means keeping more water in the forest system (increased water quality as well)

- a. Critical component that impacts other supply/utility systems (*i.e. fires impact water use/availability*)

- b. SB 1122**

- c. Sustainable forest management - change the way we manage the forests (we need to change the way private landowners, state and federal land managers maintain/manage forests across jurisdictional lines)
 - d. Climate action team – long term plan to make sure forest will sequester carbon (water sequestration is a benefit)

- 2. Combined Heat/Power Plants

- a. Good chance to displace plants that would otherwise be fossil plants while generating power from forest residue that might otherwise harm the forests or burn

xxvi. *Andrew McMillan*, Manager at Northern Hydro-Office, **SCE**

- 1. SCE Big Creek Hydro Project (San Joaquin River Basin)

- a. **Stats:** 1.8M acre-feet runoff, Drainage area of 1,300 square miles, 560K acre-feet storage water (supports irrigation, hydro-electric power and other uses)

b. Issue #1: Drought → Contractual licensing requirements, water supply and storage

i. Water delivery may be required earlier in the year while energy markets require it later in the year (coordinating water needs at different times of the year) → Requires increased cooperation and communication with downstream water interests (*i.e. PG&E*)

ii. Field Data Collection: Flow meters, acoustical sensors, and other gauges that feed into iterative management systems to produce power and ancillary systems (use radio communications to connect to main data system)

1. **Data flow:** Real time data → Long term

Forecast Model → Short-term Model → Water Use Optimization Model

2. **We need MORE data in wilderness areas** – increased data (*i.e. satellite data and moisture data*) helps better manage the watershed

xxvii. Robert Tse, Community Planning/Development Specialist, USDA-Rural Development

1. **Fire:** Another consequence of drought → Impact on sustainability (fire → water → energy use)

a. **Yosemite Rim Fire (August 2013)** – Cost \$125M to fight (property and economic loss)

- b. CA's forests are typically more dense (catastrophically large fires are a result) → thin the forest and remove the undergrowth (has side-benefits)
- c. Water – watershed is the source for CA's water consumers
- d. Energy – source of CA's hydro-power – greatly diminished by smaller snow-pack and drought → technology advancements in bio-energy can be used (conversion of woody biomass into energy – multiple benefits)
 - i. Units are mobile/portable increase cost benefit by reducing transportation costs for the woody mass (in testing in other regions of US/world) → reduced fire risk and increases water yield (saves \$)
 - ii. Communications/network access is key (Public Safety Issue for firefighters) – also means local residents are not as easily warned → also increases ability to use new technology to monitor forest
 - iii. US Forest Service – uses or investigate use of drones to assess forest conditions (can even use heat sensors to evaluate sources of fire before visible)

xxviii. *Alvin Thomas*, Director of Power Generation, **PG&E**

- 1. Largest privately held hydro-power system in the country
 - a. CA's natural cycle impacts operation of the hydro-systems
 - b. Snow accumulation and first-rain ground saturation is key to timing/operations as well → optimizing use is key

- c. Inputs: large amount of data is shared with various agencies (precipitation, snow accumulation, water levels in reservoirs and streams, weather, etc.)
 - i. Automated sensors (stream flow meters, level sensors, snow data, etc.)
 - ii. 10 Hydrographers – manual measurements
 - iii. Weather forecasts – helps forecast hydro data and what water/energy use will be in near future
 - iv. Public Safety – keeping with min/ max parameters for various data requirements ensures safety for public and wildlife (*i.e. water levels and flow rates*)
 - 1. Use of social media to update public (white-water rafters for example)
- d. Data is inputted into control system models – enables seamless operation and shared with other agencies (radio and satellite communications)

xxix. Commissioner Sandoval comments:

- 1. **“Ground-truthing”** – using satellite is great, but also need to use other methods to map/analyze forest under the canopy (working with colleges to conduct these operations is low-cost method)

e. Big Data, communications for water storage, management, transfer, satellite, meter aggregation, privacy

xxx. David Rosenheim, Climate Registry

- 1. Only government backed greenhouse gas reporting registry (support voluntary/mandatory programs, centralize data, track performance in key sectors)

2. Water GHG protocol – *Finding a measurable path to sustainability*

- a. Data on various steps of the water cycle is available, but we need more complete data and GHG related data is minimal (no accurate metrics for all sources across the water cycle)

b. Goals:

- i. Need to develop consistent metrics (allows consumers to save water, energy, money and emissions)
- ii. Useful long-term planning, smarter decision making & communications
- iii. These will allow for benchmarking (comparative analysis), crediting and accurate reporting

- c. Protocol characteristics (to enable better calculation tools, education, training and communication b/w water, energy and climate organizations):

- i. How to define geographic, organizational and operational boundaries
- ii. Avoid double-counting
- iii. Which gases to report
- iv. Water-source based calculations

xxxi. *Jeff Campbell*, VP Govt. Affairs, **Cisco**

- 1. Better Data: Ag sensors can measure all kinds of parameters (moisture, fertilizer data, pest problems, etc.) → constantly evolving
 - a. Water-leaks: sensors can identify unusual water usage patterns

- b. Sensors that automate farming processes should be maximized (*i.e. increased rain might open up irrigation system*)
 - i. Lower cost for microchips now enable plowable chips

xxxii. Jon Spalter, Founder of Mobile Futures

- 1. Based in Washington, D.C.
- 2. Old methods of conservation from 1970s still valid today (increase awareness of these for new generation by using social media, etc.)
- 3. 60M households can use the “green button” initially started by Obama in 2011 to download their water/energy use data (engages customer in increasing efficiency and lowering use/saving money)
 - a. Several apps available today to do this (implement these apps to help cut use)
- 4. “Next-Gen Agriculture” – 52% of water usage is committed for farming
 - a. Farmers need to use water more wisely and similar apps (like “Pow-wow”) can enable this → *need network access*
- 5. FIRE:
 - a. Firefighting apps (like *Page Out*), can allow firefighters to indicate who is en route, available, location, etc.

xxxiii. Lee Tien, Senior Staff Attorney, Electronic Frontier Foundation

1. Privacy Perspective:

- a. Primary Issue with smart meters is the potential for highly granular data to be interpreted and inferred so that

outsiders can know what people are doing in their homes/buildings

- i. Interval Data – can infer presence in a home
- ii. Water – what is in the water can be revealing (Automated sensors for chemical or bacterial composition might reveal medications used, or other activities)

1. While there are standards for energy information practices – **PUC § 8380 (SB 1476)**, there needs to be the same fair information practices for water utilities to protect data from being used from unintended, secondary purposes

2. Key aspects of **D. 11-07-056 Privacy Rule:**

- a. Energy usage Data is “covered information” if an individual, family, residence or household, or non-residential customer can reasonably be identified

iii. **Drones** – New proposal in legislature regulates this

xxxiv. *Brian Farhi* , Business Development at **NEST**

- 1. Making efficiency (regardless of whether it be for water, energy, or so on) seamless is key to involving more consumers
- 2. Company produces thermostats, smoke detectors, CO detectors, etc.
- 3. Partnership between NEST and Thread

- a. Collective objectives can be addressed (cyber-security can drive adoption of the system/product)
- b. Privacy restrictions are transparent (storing data, etc.)
- c. Thread – device to device protocol → products related to water can take advantage of other occupancy info/patterns (*i.e. LifeX lightbulbs flashing red when a CO detector is activated*)

xxxv. Steve Schmidt, Founder of House Energy Analytics

- 1. Residential energy and water use has become more complicated and diverse (variations have different root causes)
- 2. Opower Program – 2.5% savings reported but hard to track what residents are doing to save energy
 - a. Uses data from neighbors to determine changes needed
- 3. More specific recommendations = more savings (more responsive customers)
- 4. HEA has used water and gas smart meter readings along with weather data to calculate precise savings data (when to turn the temperature down 1 degree for instance) to save energy/\$
 - a. City of Mt. View has given its residents access to this service/info for free and on average, residents saved \$169 a year on energy bills (10% roughly)
 - b. Some sort of recirculation hot water pumps save gallons of water a day but use too much energy doing so

xxxvi. Tim Hirou, Founder/CEO of Convergence Wireless

- 1. Focus on large-scale systems → provide more efficient automation systems

2. **Lighting systems:** Convergence Systems can enable demand response, sophisticated control and remote monitoring
 - a. Wireless, radio switches – self-powered so no batteries or maintenance + photo-voltaic sensors that are self-powered

xxxvii. Questions Session – *What are barriers to implementing programs:*

1. Climate Registry: to get protocol off the ground: funding and making sure right shareholders are participating
2. Cisco: lack of awareness/knowledge + Funding (public sectors are most difficult) + allowing more effective cross-industry integration of systems (partnerships benefit everyone)
3. Mobile Futures: Connectivity – having more areas able to achieve goals by having access to communications networks (facilitates awareness, education, actual technology, etc.) + Partnerships between industries
4. Electronic Frontier Foundation: Security of networks involved in business/home dictates consumers' comfort with systems
5. NEST: Privacy (companies that require personally verifiable info decreases effectiveness of a product/program → why Thread/Nest combo is so effective (transparency + protection to customers)
6. HEA: Access to water data (like Green-button) → hard to access water utility data (no efficient access to such data so hinders HEA's efforts)
7. Convergence Wireless:

f. Enhancing communications & energy infrastructure to support water/energy nexus & management; aligning CPUC, state & federal programs

xxxviii. Moderator: Sue Sims, Executive officer, CA Water Commission

1. Commission founded in 1950s – eminent domain, water regulations, water projects, and other responsibilities
2. **Lack of infrastructures in all tribes across the state:** Broadband service, communications (public safety and forest fire risks impacted)

xxxix. Celeste Cantu, GM at Santa Ana River Watershed Project Authority

1. Created in 1968 – court order founded organization to facilitate conflict resolution

a. Main Issues

- i. Efficient water supply has left users without data on efficiency, use, energy nexus info, cost, sources, rates, etc.

1. Farmers have had to start pumping from Colorado River Basin (groundwater source) to supply crops due to drought (2.5x amount that the river delivers)

- a. CA – State regulatory framework should help with groundwater management → but currently, not every water district in CA has water meters (need to change this to increase synergy/data sharing)

2. Outdoor water use is 80% of highly treated (carbon-footprint impacting) water → reducing lawn watering and replacing lawn with tress/bushes that only take 10" of water a year (instead of 55" like grass) can save huge
 - ii. Communities who do not have access to potable water
 - iii. Lack of broadband connectivity in same areas
 - iv. Need better relationship with US Forest Dept. (so now a MOU is in place and getting funding to coordinate benefits b/w watershed and downstream water)
 1. Forest-First – 90% of precipitation falls in forest – cooperation helps extract more out of water source (funding fire prevention services means less fire-fighting expenditures and lower water costs and increased water/air quality)
- xl. Barbara Ferris, GM of public utilities dept., Hoopa Family Tribe**
1. 144 square miles – along Trinity River in Humboldt County (established in 1876 by executive order) → 1952, Hoopa Council was formed (governing body)
 - a. Current water sourcing is done via pumping water to storage tanks and subsequently gravity feeding to users (very expensive method)

- b. Isolated service area means power loss during winter months due to terrain of the land and heavy rains/falling trees/rock slides → Telephone lines are also down often
- c. Verizon – provides telephone service in the area (unable to take advantage of savings from other companies as a result of monopoly) → looking forward to broadband services
- d. Network services are so unreliable that SCADA is impacted (thus causes requirement to manually monitor tanks and measurement equipment) → wastes money (more labor and inefficiency)

xli. Cathy Emerson, Manager, Northeastern and Upstate CA Connect

Regional Broadband Consortia

1. 3 overlapping broadband grants – Cathy manages all three (Sonoma to Modoc area)
2. Broadband availability map – not indicative of end user issues
 - a. CA Broadband report (co-published by Cathy) → will hopefully aid in facilitating broadband implementation in rural areas
 - b. Mobility issues are larger than expected (where infrastructure has existed, speeds are now higher and where they have not existed, the services that are in place are getting slower and slower)
 - c. Rural areas are severely lacking in broadband → creating large public safety risks for first responders (forest fires)
 - i. **Maps** comparing broadband data network coverage vs. fire areas proves this

- ii. Almost 50% of all households who are unserved by broadband services are in northern CA
- iii. Highest risk of forest fire dangers correlates directly to this
- d. Postal offices and hospitals are also lacking in technology and staffing
- e. AT&T and other broadband providers are fighting changes in definition of broadband (4MB download and 1MB upload speeds) because current markets deemed “served” will then qualify as “unserved”
- f. Private companies are willing to spend revenue to create necessary infrastructure → elected officials have already agreed they will sign some sort of tax relief bill to raise money necessary
- g. Impacts schools – puts rural children at severe disadvantage + prevents proper CORE testing + created sub-third world area within CA

xlii. Commissioner Sandoval comments

1. Lawrence Livermore Labs – perhaps they can generate an exact number of what % of unserved/under-served broadband population is also in high-fire risk areas → this is the next step in order to move forward
2. We need to change people’s thinking and cultural norms regarding lawns, and other aspects of everyday life that drain resources

(END OF ATTACHMENT B)

ATTACHMENT C

Summit on Water Technology & the California Drought: Leveraging Technology to Build a Drought Resilient California

https://www.gov.ca.gov/s_watertechsummit.php

Hosted by California State Government

Sponsored by Imagine H2O and the
Association of California Water Agencies (ACWA)

Friday, July 10, 9:00 AM to 4:45 PM, with reception to follow
CalEPA Headquarters, 1001 I Street, Sacramento, CA 95812

Webcasted video recordings of summit:

<https://www.youtube.com/playlist?list=PLt1xE2ga7V3TNhhsthbBRw48nX03eGAs1>

The Agenda for the Summit is provided here, along with web links to presentations and a summary of primary themes of the summit proceedings prepared by Commissioner Sandoval's Office.

WATER TECHNOLOGY & THE CALIFORNIA DROUGHT

Summit on Water Technology & the California Drought: Leveraging Technology to Build a Drought Resilient California

Hosted by California State Government

Sponsored by Imagine H2O and the Association of California Water Agencies (ACWA)

**Friday, July 10, 9:00 AM to 4:45 PM, with reception to follow
CalEPA Headquarters, 1001 I Street, Sacramento, CA 95812**

8:15-9:00 AM: REGISTRATION AND TECHNOLOGY EXPOSITION

Water technologies that have been successfully deployed in California will be on display outside Byron Sher Auditorium during the daylong summit. A light breakfast will be served in the Klamath Training Room on the second floor of the CalEPA building.

9:00-10:30 AM: PLENARY SESSION ONE (Byron Sher Auditorium)

- **Welcome: Wade Crowfoot, Deputy Cabinet Secretary, Office of Governor Brown**
- **Opening Remarks: Assemblymember Marc Levine, California State Assembly, Chair of Committee on Water, Parks, and Wildlife**
- **Water Technology in California Today**
Presenters will outline the current state of water technology and highlight where it has been successfully deployed across agricultural, urban and residential, and commercial and industrial sectors.

Moderator: John Laird, California Natural Resources Agency

- **Water Technology in Agriculture**
What technologies have been successfully deployed by California growers today and to what scale? What new and promising technologies are not yet commercialized? What challenges exist to expanding or improving technologies for agricultural irrigation?
Presenter: David Zoldoske, CSU Fresno
- **Water Technology in the Urban and Residential Sector**
What technologies have been successfully implemented by urban water agencies in California cities and towns? What new and promising technologies could be deployed in the near future?

What are the barriers to expanding and improving technologies in the urban and residential sector?

Presenter: Heather Cooley, Pacific Institute

- **Panel Discussion: Reactions to presentations and thoughts on current landscape**

What other water technologies been effectively deployed in California? Are there technologies that have been deployed outside of California that are not yet scaled up in our state? Where do the greatest opportunities exist for increased use of technology to improve California's water use?

Panelists: Charles Burt, California Polytechnic State University, San Luis Obispo
Alex Coate, East Bay Municipal Utility District
Jennifer West, WateReuse California
Peter Williams, IBM

10:45-11:45 AM: DEEP-DIVE SESSION

Summit participants choose one session to attend

1. **Agricultural Water-Use Efficiency: Water Technologies to Improve Farming and Ranching (Coastal Hearing Room)**

What technologies should be introduced or scaled up in the agricultural sector? Specifically, how can we expand drip irrigation and other forms of water saving irrigation technology? To what extent can we increase broadband access to leverage wireless irrigation technology and precision agriculture? What new technologies show promise in this sector?

Facilitators: Sargeant Green, CSU Fresno

Karen Ross, California Department of Food and Agriculture

2. **Expanding Water Supplies: Water Technologies to Recycle or Desalinate Water (Sierra Hearing Room)**

Where do these technologies stand? How can they be improved or scaled up? What are the barriers to increasing water reuse and augmenting existing supplies?

Facilitators: Jeffrey Mosher, National Water Research Institute

William Steele, US Bureau of Reclamation

3. **The Water Energy Nexus: Opportunities to Improve Water and Energy Efficiency Together (Byron Sher Auditorium)**

Where are the greatest opportunities to leverage technology to decrease the embedded energy in urban and agricultural water sourcing, treatment and conveyance, and end-use? What technologies can increase the efficiency of water use for energy production? How can we support increased deployment of these technologies?

Facilitator: Catherine Sandoval, California Public Utilities Commission

Robert Weisenmiller, California Energy Commission

11:45-12:45 PM: LUNCH AND TECHNOLOGY EXPOSITION

Please join us for lunch on the second floor of the CalEPA building to further explore technologies on display. Lunch will be served in the Klamath Training Room.

12:45-2:15 PM: PLENARY SESSION TWO (Byron Sher Auditorium)

- **Opening Remarks: Senator Bob Wieckowski, California State Senate, Chair of Committee on Environmental Quality**
- **Moderator: Kamyar Guivetchi, California Department of Water Resources**
- **Achieving a Sustainable California Water Future through Innovations in Science and Technologies: Findings of a report from the California Council on Science and Technology (CCST)**

**Presenters: Jeff Dozier, UC Santa Barbara
Karl Longley, CSU Fresno**

- **Panel Discussion: Discussion of challenges and opportunities to expand water technology**
How can water technologies be prioritized and implemented? What are the current barriers to expanded deployment of successful technologies? How can the state, water agencies, and other stakeholders support further water technology deployment?

**Panelists: Don Cameron, Terranova Ranch, Inc.
Peter Gleick, Pacific Institute
Joe Grindstaff, Inland Empire Utilities Agency
Tamin Pechet, Imagine H2O**

2:30-3:30 PM: DEEP-DIVE SESSION TWO

Summit participants choose one session to attend

- 4. Residential and Commercial Water-Use Efficiency: Water Technology for Water System Management and End-Use Efficiency (Byron Sher Auditorium)**
What are the most promising technologies to improve urban water system management and end-user efficiency? How can we expand and improve data for better water use? What tools and data-sharing platforms are needed to leverage water technology? What other technologies are most promising to help homes and businesses better use their water?
**Facilitators: Max Gomberg, State Water Resources Control Board
Frank Loge, UC Davis**
- 5. Fostering Innovation: Commercializing Water Technology and Economic Development Opportunities (Sierra Hearing Room)**
What are the current barriers to introducing and scaling-up new technologies? What strategies have successfully supported commercialization of water

technologies? Who implements these strategies and what role do water agencies and local and state government play in these strategies?

**Facilitators: Teveia Barnes, California Infrastructure and Economic Development Bank
Scott Bryan, Imagine H2O**

6. Managing Natural Systems: Water Technology for Improved Watershed and Ecosystem Management (Coastal Hearing Room)

What technologies can help improve management of our ecosystems? How can we increase deployment of technology for sustainable watershed and ecosystem management?

**Facilitators: Chuck Bonham, California Department of Fish and Wildlife
Randy Fiorini, Delta Stewardship Council**

3:45-4:45 PM: CLOSING PLENARY: DISTILLING KEY FINDINGS FROM DEEP-DIVE SESSIONS AND WHERE WE GO FROM HERE (Byron Sher Auditorium)

One facilitator from each breakout session will report major “take-aways” from their session and share new ideas and emerging areas of consensus. The speaker will then highlight promising areas of focus in the coming months and years to deploy and expand water technologies.

- **Moderator: Wade Crowfoot, Office of Governor Edmund G. Brown, Jr.**

4:45-7:00 PM: RECEPTION HOSTED BY IMAGINE H2O AND TECHNOLOGY EXHIBITON

Please join us for a post-summit reception hosted by Imagine H2O outside of Byron Sher Auditorium and further explore technologies on display on the second floor of the CalEPA building.

SPECIAL THANKS TO OUR SUMMIT CO-SPONSORS



IMAGINE {  } H₂O

Summit Agenda http://gov.ca.gov/docs/Summit_on_Water_Technology_Agenda_07515.pdf

Biographies for all speakers, moderators, and deep-dive breakout session facilitators.
http://gov.ca.gov/docs/Summit_speaker_moderator_facilitator_bios.pdf

Live Webcast- The Summit on Water Technology and the California Drought will be a live webcast for those unable to attend in person. You may view the morning and afternoon plenary sessions and all six deep-dive breakout session discussions by following this link: <http://www.calepa.ca.gov/Broadcast/>

Webcast Video Recordings - View the video of each session here.

Presentations - used for each session are available below.

Plenary Session One

- Opening remarks by Assemblymember Marc Levine
http://gov.ca.gov/docs/Opening_Remarks_plenary1_Levine.pdf
- State of water technology in agriculture by David Zoldoske, CSU Fresno
http://gov.ca.gov/docs/9AM_Water_Technology_in_Ag_Zoldoske.pdf
- State of water technology in the urban and residential sector by Heather Cooley, Pacific Institute
http://gov.ca.gov/docs/Residential_and_Commercial_Water_Use_Efficiency_Byron2.pdf

Deep-Dive Session One: Agricultural Water Use Efficiency

- Slides used by facilitators Secretary Karen Ross, California Department of Food and Agriculture, and Sarge Green, CSU Fresno
http://gov.ca.gov/docs/Agricultural_Water_Use_Efficiency_Coastal1.pdf

Deep-Dive Session Two: Expanding Water Supplies

- Slides used by facilitators Jeff Mosher, National Water Research Institute, and Bill Steele, US Bureau of Reclamation http://gov.ca.gov/docs/Expanding_Water_Supplies_Sierra1.pdf

Deep-Dive Session Three: The Water Energy Nexus

- Slides used by facilitator Chair Robert Weisenmiller, California Energy Commission
http://gov.ca.gov/docs/Water_Energy_Nexus_Byron1_Weisenmiller.pdf
- Slides used by facilitator Commissioner Catherine Sandoval, California Public Utilities Commission http://gov.ca.gov/docs/Water_Energy_Nexus_Byron1_Sandoval.pdf

Plenary Session Two

- Achieving a Sustainable California Water Future through Innovations in Science and Technologies: Findings of a report from the California Council on Science and Technology (CCST) by Jeff Dozier, UC Santa Barbara, and Karl Longley, CSU Fresno
http://gov.ca.gov/docs/CCSTreport_plenary2.pdf

Deep-Dive Session Four: Residential and Commercial Water Use Efficiency

- No slides were used.

Deep-Dive Session Five: Fostering Innovation

- Slides used by facilitators Teveia Barnes, California Infrastructure and Economic Development Bank (I-Bank), and Scott Bryan, Imagine H2O
http://gov.ca.gov/docs/Fostering_Innovation_Sierra2.pdf

Deep-Dive Session Six: Managing Natural Systems

- Slides used by facilitators Chuck Bonham, California Department of Fish and Wildlife, and Randy Fiorini, Delta Stewardship Council
http://gov.ca.gov/docs/Managing_Natural_Systems_Coastal2.pdf

Closing Plenary

- No slides were used.

Summary

California's historic drought presents an opportunity to reimagine water use and management in our state. The water technology summit allowed utilities, policy makers, companies and the public to reimagine water use and management in the state to improve California's drought resiliency. The breakout sessions explored how water technology in different areas of water use and management.

The breakout sessions included the topic areas of:

1. Agricultural water-use efficiency for farming and ranching
2. Water technologies to augment existing water supply
3. Technologies to improve water and energy use together
4. Residential, commercial, and industrial water-use efficiency
5. Innovation and commercialization of water technology
6. Natural ecosystem and watershed management

Water technologies showcased assisted water management in the areas of commercial and industrial users, growers, irrigation districts and water agencies targeting water use, recycling, or irrigation technologies.

A reoccurring theme of the day showcased that water technology currently exists, have proven remarkably effective, but are not broadly deployed.

Technologies for more efficient urban and commercial, industrial, and institutional (CII) water use:

- low-flow and high-efficiency appliances
- greywater and blackwater recycling
- on-site reuse
- metering and sub-metering of water use

- integrated data collection and analytical platforms
- advanced metering infrastructure (AMI)
- benchmarking/social-norming strategies
- remote leak detection and repair
- in-conduit hydroelectric power generation

Technologies to expand water supplies:

- groundwater recharge
- urban and residential greywater and blackwater recycling
- on-site reuse
- on-farm recycling of brackish water
- forward osmosis desalination
- remote water quality monitoring for recycled water treatment and distribution systems

Technologies for more efficient agricultural water use:

- drip irrigation
- flow meters
- on-farm broadband access
- integrated data collection and analytical platforms
- groundwater recharge
- evaporation control
- ground penetrating radars to map aquifers boundaries, depth, and salinity
- technologies to improve soil health
- on-farm recycling of greywater and brackish water

Technologies for improved ecosystem management:

- In-river and in-stream cameras
- In-stream flow monitors
- monitoring sensors in meadows and upper watersheds of the Sierra Nevada and Cascade ranges and the Sacramento-San Joaquin Delta
- integrated data collection and analytical platforms
- instantaneous fish populations monitoring to better manage the San Joaquin-Sacramento Delta and state and federal water projects
- Species monitoring through collection and analysis of species DNA in the environment

Major Themes and Questions

Theme 1: Summit participants discussed the difficulty of discerning which technologies on the market best fit their use. Water agencies, growers, and CII users in the audience agreed they don't know where to look to find available technologies and often don't feel comfortable evaluating a product's claims given the data available. The water sector's risk-averse culture compounds this issue, many water agency leaders pointed to the industry's aversion to risk as a primary contributor to limited adoption rates of new technologies.

How can the CPUC help to develop the data sets necessary to increase the comfort needed to enable adoption? What existing state financing mechanisms, particularly those for water agencies, growers, and startup water technology companies exist and how might they be accessed?

Theme 2: Some of the most promising water technologies, like water recycling, may retain a public perception barrier. Since this technology is determined to be the next marginal source of water, how can the CPUC break down that public perception to promote development and use of recycled water?

Similarly, how can the CPUC help promote ecosystem services through water technology that can protect and manage environmental habitat? How can the CPUC better express the public value of natural systems and increase the public's value of the environment, attract young talent and venture capital, and encourage market innovation?

What are the current barriers for introduction and scaling-up of new technologies? What strategies have successfully supported commercialization of water technologies? Who implements these strategies and what roles do water agencies and local and state governments play in these strategies?

What strategies should be considered to address the large disparity in the demand and cost of water in different parts of the State? Are the programs and resources available from water agencies and local and state governments adequate? How can existing programs (NGOs, Universities, Incubators) play a role? Are there programs or incentives in other states or countries that we should be considering for California? Are there programs or incentives in other industries (like power, biotech) that we should consider applying to water? Does access to financing for new water technologies present any barriers? What strategies have successfully assured that a new water technology is proven before it is rolled out for purposes of financing? What are lessons learned from

the past that we can consider as we try to move the water industry forward in California?

Theme 3: Summit conversation emphasized that the deployment of technology to measure water use is inadequate at all levels in California: at the state level, within regions, by local water agencies and irrigation districts, and among end users. The current lack of collected and shared data makes it difficult for water agencies to manage consumer water use and measure their return on investment. There was broad consensus that the culture around data collection, dissemination and use among water managers at the water utility and irrigation district level needs to shift to improve utility operation and engage customer participation in conservation measures and activities. Additionally, metering multi-unit dwellings remains challenging for urban water agencies. There also gaps in agricultural data use and management and many agricultural users have not yet invested in the technology to better measure and manage their use. Leading habitat managers agreed that the state does not have sufficient real-time data to most effectively manage ecosystems and water operations. For example, many highlighted the need for more in-stream monitors, underwater cameras, and hyperspectral remote sensing to locate fish in real-time to reduce mortality at pumps. To manage salinity in the Delta and protect endangering fish species, federal and state water project managers need to know how many fish of different species are at a specific location at any given time.

(END OF ATTACHMENT C)

ATTACHMENT D

Joint Workshop of the California Public Utilities Commission, the California Office of Emergency Services and the California Department of Technology to discuss Federal Connect America Fund (CAF) to build out broadband and telecommunications infrastructure in California's rural and high cost areas.

California Office of Emergency Services Main Office
3650 Schriever Avenue, Multi-Purpose Room 1st Floor
Mather, CA 95655

Friday October 30, 2015 9:00am-5pm

Part 1: <http://www.ustream.tv/recorded/76634731>

Part 2: <http://www.ustream.tv/recorded/76648674>

Agenda

9:00-10:00 am - Welcome, Setting the Stage, Connect America Fund Overview
Catherine Sandoval, Commissioner, CPUC
Sunne McPeak, President, CETF
Cynthia Gomez, Tribal Advisor, Office of the Governor
Robert Osborn, Senior Analyst, Communications Division, CPUC
10:00-10:45 am - Communications in Water Management and Agriculture
Richard C. Svindland, P.E., V.P. Operations, California American Water

Robert Tse, State Broadband Coordinator, Strategy for Agriculture
Technology and Innovation, USDA CA RD

10:45-11:00 am Mark Ghilarducci, Director, California Office of Emergency
Services

11:00-11:15 am - Break

11:15 am -12:15 pm - Communications for Energy Management, Including Public
Safety and Fire Risk Management

Catherine Sandoval, Commissioner, CPUC

Danny Zaragoza, Director, Emergency Services, SDG&E

Chase Sun, Distribution Grid Manager, PG&E

Art Anderson, Communications Lab Manager, PG&E

Robert Melis, Manager, Data Center & Operations, CAISO

Dennis Peters, External Affairs Manager, CAISO

Everymary Hickey, Director of Preparedness and Response Support,
PG&E

Adam Velardo, IT Manager, SDG&E

Rick Montero, Distribution Grid Communications, Smart Inverter Group,
SCE

12:15-1:30 pm - LUNCH BREAK

1:30-1:45pm Carlos Ramos, Director, California Department of Technology

1:45-2:45 pm - Leveraging Connect America Fund Deployment

Adelina Zendejas, Deputy Director, Broadband and Digital Literacy Office

John Popoff, Deputy Program Director, California High Speed Rail

Herby Lissade, Chief, Office of Emergency Management

Jeffrey Sinsheimer, California TeleHealth Network

2:45-4:00 pm - Community Perspective

Dr. William Johnston, Advisor to Commissioner Catherine Sandoval

Penny J. Eckert, Orleans Community

Steve Blum, President, Tellus Venture Associates

Michael Ort, CEO, Praxis

Felix Robles, Supervisor, Carrier Oversight and Programs Branch,
Communications Division, CPUC

4:00-4:45 pm - Telecommunications CAF Deployment (AT&T, Frontier)

Dr. William Johnston, Advisor to Commissioner Catherine Sandoval

Eric Batongbacal, Executive Director-Regulatory, AT&T

Tressa Bader, VP & GM California, Frontier Communications

4:45-5:00 pm - Closing Remarks - Commissioner Catherine J. K. Sandoval

Themes and Questions

Collecting data is not the only challenge. Users across all sectors shared the need for integrated data management tools to effectively use the information they collect. Informational tools should be created to increase awareness of available technologies. For water agencies metering customer water use, data integration and management is often costly and time intensive, making it difficult to translate collected data into meaningful customer communications. Growers expressed the need for broader integration of data collected by software and hardware in the field in a unified platform to make best use of existing technologies. Specifically, growers need a single platform to synthesize data from the sensors, aerial images, and application equipment in the field to operationalize data and make informed irrigation management decisions. This remains a challenge particularly for small and medium sized growers. While platforms that integrate structured and unstructured data exist and are in use by some, cost remains a barrier to broader use. Watershed managers also lack synthesis and modeling tools to integrate data on fish and in-stream flows into decision making. Managers need tools to transform hydrological and scientific data input in many different forms into a modeling tool for better communication between scientists and ecosystem managers.

1. How can the CPUC promote more data collection and use in all areas while also protecting confidentiality in the collection and sharing of data?
2. What types of informational tools should be created to increase awareness of available technologies? How can technology and data be better leveraged for water planning in the next year, 5 years, 10 years? Should the

CPUC convene interagency working groups to dive deeper into strategies to further integrate technology into specific areas, including watershed management and irrigation? And or identifying strategies to expand deployment of agricultural water use monitoring technologies, information management tools, and increase technical assistance and education for users in the field?

The state was constantly encouraged to collect data on all water uses in California.

3. Is universal metering a critical step towards better water use? Are there other methods that can be utilized to achieve the same goal?
4. With increased data collection, who should be responsible for helping to analyze the data and make recommendations about the data to government agencies? Should the CPUC convene a working group to develop and report state standards for data reporting and analysis? How can the CPUC help to coordinate across agencies to help identify how water technology can be deployed to achieve multiple benefits including greenhouse gas reduction in the water and energy management sector?

Where California has large urban areas, geographically, 95% of the state is rural. A lack of broadband infrastructure occurs in various geographic areas in the State of California resulting in lack of internet service provided to communities, water and energy infrastructure. Unserved and underserved communities either with no or slow internet service lack the ability to upload or download necessary information such as homework, class lessons, medical records, lectures, and web-based ordering and selling things. Though hard to imagine, internet service is challenging to procure in and among communities lacking energy infrastructure because telecommunications service requires power to work.

This lack of internet access impacts tribal, rural and agricultural lands most acutely. An inability to connect to the internet, interconnect devices, and upload or download data and information prevents individuals and communities from optimizing water and energy resources, resource management, use, and complicates the development of greenhouse gas emission reducing distributed energy resources, deployment and incorporation of smart grid infrastructure, and the incorporation of the Internet of Things. Without internet, all you have are things.

Energy facilities lacking internet connectivity can't communicate energy services to facility management in real or near-real time. Provision of data about volts, amps, KVWR and KWs help energy facility managers optimize the resource on the grid as well as enable the facility to participate in the CAISO market. Communicating about electric services, known as telemetry in the world of energy providers, is a requirement for legacy energy facilities like substations, gas fired power plants, and hydroelectric resources, as well as for new distributed energy resources like storage, solar, electric vehicles, wind facilities, fuel cells. This requirement to communicate energy service ties all electric generation facilities attached to the electric grid and distributed energy resources generally, all across the State of California.

Water facilities that treat ground and surface water, desalinate water, recycle water, treat waste water, generate water, also require telemetry. The ability to communicate to management important data points like water levels, pump pressures, chemical content, turbidity, flow rates, and other metrics, are all required data to be measured and communicated to facility managers. Furthermore, electricity inputs make water systems produce water and electricity inputs into the system must also be measured and optimized. The requirement

to communicate connects all water generating facilities embedded into the communities of the State of California with the added component of the electricity inputs required to make them work.

The ability communicates water and electricity data to system managers and for facility optimization purposes requires internet connectivity and access. Without internet access, these two data elements can't assist in the management and optimization of these resources.

5. Would it be efficient to create a standardized internet services tariff for water and energy facilities in the State of California? Would a standard internet services tariff for water and energy facilities promote and enable efficient development, management and optimization of water and energy facilities in the State of California? Why or why not?
6. Just as the world of Demand Response is bifurcated into load modifying and supply side resources, should 2 standardized internet services tariffs be developed – one for internet to be provided for energy and water facilities behind the meter, in residences/businesses and another standardized internet services tariff for supply side or distribution grid connected energy and water resources?
7. How can the CPUC ensure that internet providers, water and energy utilities collaborate to ensure internet connectivity to help optimize the management of water and energy services and the deployment of greenhouse gas emission reduced distributed energy resources, the smart grid, integration of the Internet of Things to enable the structural and behavioral changes that result from data driven decision making (the creation, collection, analysis and dissemination of data)?
8. Should the CPUC order a meet and confer between energy, water and telecommunications utilities to ensure forward movement in enabling communications for better water and energy management and optimization, ensure cooperation in optimally leverage federal Connect America Fund Dollars alongside water and energy services providers to promote public safety, water and energy conservation and greenhouse gas reduction?

9. How can the CPUC and sister agencies increase consultation and collaboration with tribes to ensure that energy, water and internet deployment projects occur, avoid important traditional sites and increasing collaboration among communities, and for CEQA compliance? Should CPUC get utilities together to meet and confer about how to best leverage federal dollars in the Connect America Funds for water and energy management, smart grid development, IOT integration for structural and behavioral changes using data creation, analysis and input?

The drought has changed the energy footprint of water utilities. An ability and inability to use cell phones and internet access impacts utility worker efficiency. With communications, workers can more quickly respond to water service calls and efficiently stop leaks and hydrant breaks, for example. Company trucks double as a workstations and the ability to communicate back to headquarters are hindered in cell service and broadband coverage dead-zones (even in affluent areas like Monterey). Dead zones lead to increased GHG emissions when technicians are deployed from farther away resulting in lengthy response time in dealing with water and energy wasting situations like leaks.

10. How can the CPUC help educate water utilities requiring energy services about low water using, greenhouse gas emissions reduced energy generation alternatives? How can the CPUC encourage water utilities to learn about and leverage renewable energy technologies and move away from diesel power? How can the CPUC help to ensure water and energy utility worker efficiency by closing the telecommunications access gaps so that trucks can efficiently be workstations from all locations and efficiently provide service to customers to stop leaks and hydrant breaks, downed power lines and other public safety and security issues? How can the CPUC help to procure more water use system data and customer water use data to improve data input for billing purposes? Water system controlled using SCADA - how can we ensure that SCADA system use

continues and is upgraded as required for safe reliable service at just and reasonable rates? How can the CPUC close the gap in the dead-zones?

There is a unique need to enable broadband usage/ internet access in rural communities, among farm worker communities, and on farm land. Farm workers require internet access to acquire education, utilize distance learning opportunities to farmworkers can pick up new farming skills. Farm workers require internet access in order to utilize new technology farming techniques, harness and optimize new technology for the farm: irrigation, soil monitoring, groundwater use, insect and pest location information, etc. Famers cannot acquire this information without internet access.

Farm land requires internet access to enable the use of new advanced technology on the land: internet-based applications (apps) can help optimize groundwater use, insect and pest information location information, remote monitoring, data collection, advanced irrigation through remote water and analytics of soil moisture, pesticide measurement, or maximization and efficiency in agricultural water use. Agricultural regions cannot use advanced technology on the field without internet in the field.

11. What policies can the Commission adopt to promote advanced technology use on the farmer's fields?

All energy generation and energy management devices, old and new, require a communications portal to deliver operations data for decision making purposes. All energy resources sized at 1 megawatt and larger require telemetry, backhaul, metering, low bandwidth, low latency, power telemetry to ensure power flows. Protective relays have the vital communications needs. Transmission assets are connected on field area networks.

Managing our energy system requires data to move from point of origin to point of management. Every individual facility must communicate its data. Both CAISO and Investor Owned Utilities have set protocols for energy generation devices to provide information to them. Often, energy developers lack awareness.

AB 327 completely changed supply map & characteristics of grid, move from centralized supply to distributed resources, mandate to change. CAISO and utilities need controls to better manage energy systems, optimize distributed devices, leverage and harness in home IOT devices to help better manage water and energy. Communications channels must be in service to provide weather monitoring throughout utility territory. Utilities own and operate mobile command centers when telecom service is unavailable. As needs in the field are growing exponentially, utilities are looking for innovative ways to provide communications services in mountains, disparate regions of California. This challenge is being tackled using multiple approaches including using fiber, wireless services, copper, microwave point to point, multi-point, mesh networks, low power networks, utilizing unlicensed spectrum, cellular networks, among others. A diversity of options is necessary to ensure continued operations.

As needs for enhanced communications on the distribution grid increase, traditional communications services used by energy facilities are being retired. With 4200 solar installations a month being installed on rooftops in PG&E territory, communications can enhance safety and reliability of this interconnected grid. Smart meters are connected by mesh networks that are backhauled to data centers by cell infrastructure. One million transformers on networks with streetlight control, line sensors, the backhaul relies on cell

infrastructure. All of these technologies showcase that the landscape has changed.

Without communications access, a utility has to engineer the communications solution itself. For example, the utilities are ordered to talk to smart inverters either individually, facility wide or through an aggregator, to help manage voltage. If there is connectivity through communications, it is easier to manage and get to safety and reliable access for all people, especially harder to reach areas and low income areas.

Communications, internet, must be available for utilities to make everything connect and work together. The same challenges are experienced during a wild fire and firefighting operations. Need to be able to communicate with crews to easily to restore service – get ahold of and notify crews for public safety, efficiency, state of emergency evacuations. By leveraging communications where they are found, utilities can communicate with smart inverters to provide grid data, utilities can provide monitoring and control of the inverters, facility management system, 3rd party aggregators, no matter if they are TCP-IP standards based, utilizing common protocols, IEEE 2030.5, SEP2.0 (HAN protocol with distributed energy resources).

All facilities connect to the CAISO network must enter into acceptable use agreements prior to connecting. Communicate with CAISO business partners: electric energy generation resources & electric transmission resources, adjacent balancing authorities & area control centers like IOUs. CAISO requires communications protocols and control center protocols to ensure distributed network control and controls for ISO meters for bid pricing, calls and settlement.

Renewable resources make up largest new resources to joint CAISO's ECN network and they're often very rural (large solar/ wind farms) and not in

populate areas. Customers can pick and choose how they're going to communications connect to the CAISO network. There are lease line T1 options, ANIRA a public internet access 2 the RCN end to end encrypted internet protocol managed by a broadband/cable/DSL provider, leasable managed router services etc. But there is little dialog between telco, energy and water utilities to discuss these needs or discuss a move from specialized lines and leased networks lines, private networks/lines, specialized lines. The current patchwork nature of communications limits people to engage in distributed energy resources to the advantage of communities, the grid, GHG reduction.

12. How should the CPUC facilitate a discussion about upgrading communications, firmware, etc., to ensure visibility of provided services? Should the CPUC request a meet and confer between the utilities to ensure collaboration with Connect America Fund? Expand definition to the field to ensure water and energy management beyond the household and into the field? Further coordinate and develop infrastructure & interface with households that are not online? Who should be part of the coordination efforts? What types of information should collaboration occur for distributed energy resource connection to Utility and CAISO for visibility, monetization & to support water systems? How to connect hard to reach areas in an interoperable way? How to ensure connectivity in those hard to reach areas so as to enable utilities to do energy work and not get into telco work – especially areas that are in ultra-high cost remote areas to enable nondiscriminatory, efficient connectivity? Collaborate with governor's solar siting project in rural California to increase energy coming from renewable resources? How collaboration with CAF help enable communications & cost effective water and energy management ; how can water and energy utilities help optimize deployment of CAF funding communication facilities by telco companies? Should collaboration include CalFire, US Fire Service, electric and water utilities for distributed energy resource based water and energy management?

Leveraging different funding pots will enhance broadband/ internet services to the rural community which makes up 95% of California's land mass. Rural schools still request students to perform homework tasks that require internet access. Public safety officials similarly require the internet to promote safety. Hospitals providing medical care could provide telemedicine, send X-rays to doctors for second opinions, promote voter registration, economic development, visible and deployment of integrated renewable energy facilities and zero greenhouse gas emissions energy facilities. With resilient, secure, redundant internet with rates of speed to accomplish modern day feats, internet access is clearly a missing element from many people's lives in rural California.

High speed railroad will bring state of the art communications technology to rural California. Cal Trans provides information throughout the state like real time weather stations, USGS, the greater seismic network, signs network, signal systems and ramp metering signals. Connectivity through reliable broadband network would help with public safety & sustainability, speed up federal Connect America funding where there are gaps in rural areas to provide public safety. First Net is a federal attempt a national broadband service for public safety uses. Connecting into existing transportation systems is a big area of potential collaboration to help connect various parts of California.

Using maps will showcase geographically disadvantage communities, upcoming high speed rail locations, CAF funding areas would help to promote widespread understanding and leveraging potential of the potential impacts of new telecommunications infrastructure.

Areas of California like Orleans want and need internet connectivity. Investments should be considered so that all parts of California, including log land, fog land, and smog land, are part of the telecommunications broadband

future. Orleans public services like the Forest Service, Caltrans, Watershed Council, economic prosperity, business potential (crafts, nurseries, woodworking and other art), as well as schools and tribes should be able to utilize the internet and participate in society.

Successful internet connection projects include the Digital 395 project. But 57% rural homes don't meet CPUC telecommunications standards while urban homes do. Compliance is determined place by place. Local level coordination might be helpful. Economic opportunities like data center investment are only available if broadband is available. Other economic opportunities within the water energy nexus only are possible with broadband availability, including new mills of different varieties.

13. Should water, energy and telecommunications companies establish an emergency call in number for use by public safety officials in case of emergency?

(END OF ATTACHMENT D)

ATTACHMENT E
Workshop Report on Establishing a Cloud-Based
Water and Energy Data Platform

UC Davis

June 9-10, 2016



Establishing a Cloud-Based Water and Energy Data Platform

June 9-10, 2016: *A White Paper Summary and Road Map*

Introduction

With generous support from the S.D. Bechtel, Jr. Foundation, on June 9 and 10th, 2016 the UC Davis Center for Water-Energy Efficiency (CWEE) hosted a workshop with water and energy utility executives, thought leaders, and policy makers to discuss a path forward for developing a cloud-based water and energy data platform. This workshop was designed with several goals in mind:

- Develop a shared understanding of the value of improved access to water and energy utility data;
- Understand the specific technology, policy, and legal requirements and concerns that have prevented the release of core utility data;
- Discuss and develop the major components of a data policy framework that broadly addresses and resolves key data security and privacy issues to enable utilities to participate in a cloud-based data sharing platform;
- Gain the support of utilities to inform the development of a pilot platform that can be tested and verified for compliance with the security and privacy requirements identified by workshop participants.

The first day focused on the current ways that data is shared, the importance of security and privacy, and how we can move forward towards more streamlined data sharing. The second day of the workshop was comprised of four panel sessions with the following objectives for discussion:

1. The Policy Perspective: How can we use policy to frame the parameters of a streamlined water and energy data platform?
2. The Utility Perspective: How do we develop and streamline advanced data sharing practices and analytics?
3. The Energy Perspective: How can the water sector gain insight from the energy sector's experience with data collection, management and sharing and how can the water and energy sectors share resources, particularly data, to further synergize efforts?
4. The Business Perspective: How can the water sector use data sharing to accelerate innovation and bring about new business models?

This white paper synthesizes the main themes that emerged from the workshop and outlines a road map of how to move forward with making the platform a reality.



Motivation

Dwindling water supplies and repeated droughts in the Western United States have highlighted the need for consumers, businesses, utilities, and government agencies to better manage this precious resource. More specifically, these water sector stakeholders need improved mechanisms to proactively share data, insights, tools, and solutions to achieve greater water systems optimization and improved efficiency. Recent advances in data science and cloud technologies can help to dramatically improve the effectiveness of water management, including increased capabilities for improving operations (e.g. jointly managing water and energy resource use), real-time system monitoring (e.g. leak loss detection), and in-depth program evaluation (e.g. estimating socioeconomic impacts of rate designs). These insights are fueled by data – the more accessible, reliable, and comprehensive the data are, the greater the potential for optimizing our water systems locally, nationally, and globally.

However, advancing the next generation of innovative and effective policies, technologies, and business solutions in the water sector is currently limited by the fragmented nature of water information across all sectors. One of the greatest challenges to broader data integration is overcoming the institutional barriers to exchanging data. Currently, utilities follow a framework of sharing data via individual use case evaluations where costly amounts of financial and human capital are dedicated to creating mechanisms such as non-disclosure agreements, data transfer agreements, or partnering contracts. These agreements are effective in that they allow for the data owner to give a data requester access to the data, while prescribing certain protections and restrictions to its use. Yet, the high transaction costs and delays inherent to individual data request reviews and negotiations significantly limit the opportunities to leverage detailed water system information. Addressing this challenge was a key focus of the workshop discussions.

Vision: An Integrated Water-Energy Data Platform

The UC Davis Center for Water-Energy Efficiency (CWEE) has been active in evaluating the water-energy nexus and is currently facilitating discussions among energy and water utilities to advance data-driven solutions. Through our work, it has become clear that integrating utility system data is fundamental to enabling water and energy utilities to achieve the shared objectives of increased resource efficiency and reduction in greenhouse gas emissions (GHGs).

Towards this end, we have developed a vision of a cloud-based database and computing platform to provide a centralized location for the consolidation and organization of water and energy utility data, as well as provide data analytics for increased visibility of utility system performance. While water and energy utilities are generating a wide variety and large amount of system data, the data are often disorganized and underutilized, therefore providing little benefit in measuring system performance and recognizing opportunities for efficiency. The proposed platform can be a tool for gaining insight on the efficient operation and management of utility systems by organizing the system data, performing data analytics, and developing data visualization tools. A key advantage of this approach is that any particularly useful tool or

analysis developed by one utility or platform user within the common data framework can be rapidly adopted by other utilities/users. In other words, the most successful innovations and outcomes can be extended and amplified throughout the active user network. Table 1 provides an illustrative list of potential benefits by user type.

Table 1. Stakeholder benefits of an Advanced water-energy data platform

Stakeholders	Example Benefits
Water wholesalers and retailers	Access to clean, consistent, and secure data platform to optimize water treatment, delivery, rate design, demand management and forecasting; ability to benchmark performance between utilities; improved knowledge to guide system investment.
Electricity and gas utilities	Insight into the embedded energy of water infrastructure; alignment with water utilities to help manage load at peak; incorporation of water utilities into carbon cap and trade.
State / Public Sector	Improved effectiveness of statewide and regional water resource management; ability to better monitor and verify program and policy performance; streamlined reporting systems; improved accessibility to existing state data sets.
Business and Technology Partners	Opportunity to generate business value from data analytics to improve decision-making and enable new business models; improved ability to characterize markets and predict the effectiveness of technologies deployed at-scale; opportunity to rapidly advance innovation in the sector.
Academic Partners	Increased access to a broad array of data in the water sector for research and education; streamlined mechanism for collaborative research; enhanced training for future water leaders; improved ability to seed ideas for commercialization.
All partners	Access to collaborative knowledge environment; ready availability of information for outreach and education.

While it is easy to envision a future of opportunity, we must first address the immediate challenges inherent to leveraging data from multiple, fragmented sources. The central challenge to this effort is the fact that the source data span multiple formats and levels of security, from highly aggregated publicly available data to extremely granular and sensitive data (see Appendix A for a more detailed explanation of data types and information classes). Given this backdrop, the purpose of the workshop was to convene water and energy utility executives, policy makers, and thought leaders to develop a shared understanding of the value of improved

access to water and energy utility data. The outcomes of the Day One and Day Two discussions are summarized in the following sections.

DAY ONE DISCUSSION SUMMARY

Framing the Data Policy Discussion

Data security and privacy are a fundamental concern for any institution responsible for collecting, managing, or analyzing sensitive data. Data security refers to the complete ecosystem of technological, physical, and policy tools used to protect the confidentiality, availability, and integrity of data. Data privacy addresses the appropriate use of data in such a way as to minimize the risk of harm to the individuals or institutions providing the data. The risks of inadequate data security and privacy are not limited to the commonly reported incidents of phishing, credit card fraud, identity theft, regulatory fines and data breach class actions. Large security incidents reported in recent years at major retailers, global banks, and U.S. government agencies indicate that cybersecurity risks may involve coordinated efforts to cripple infrastructure and steal strategic corporate data and state secrets.

On Day One of the Workshop, concerns around these issues of data privacy and security were discussed. The participants pointed out that the broader concept of strategic information management needs to be considered in a comprehensive manner to balance the optimization of information access with risk mitigation. A consistent and transparent framework allows all stakeholders to have a clear view of the process and thus improves function, flow, and predictability of data management operations.

In the context of this high-level risk, a highly conservative posture on releasing and sharing data is the operational norm for many institutions. While this approach represents a prudent response to the risk context, this approach carries the opportunity cost of not leveraging the deeper value of the data to broadly optimize systems operations both internal and external to the institution. Many utilities at the workshop agreed they wish to share data for legitimate purposes, such as research and policy planning.

So the main question is: If we agree that better data are needed to make better decisions, then how do we maximize access to and use of water and energy utility data while minimizing the risk of exposing sensitive data and maintaining compliance with pertinent data sharing and privacy laws and policies? Additionally, how can we streamline data sharing among multiple users and institutions, including utilities, government agencies, the private sector and academia?

An important idea shared at the workshop was moving towards a framework of *Knowledge Governance*. This framework has three stages of maturity:

1. Data governance: managing data so that it is available and discoverable throughout an organization. This includes utilizing data warehousing to improve accessibility to large data sets generated across departments in an organization.
2. Information governance (generally the status quo): goes beyond managing data to include operationalizing mechanisms to specifically manage the risk of exposing information, from a standpoint of compliance.
3. Knowledge governance: using information in a holistic way, to drive compliance, but also to thoroughly understand the value of the data itself. This includes organizations that have moved beyond simply sharing and securing the information to seeing their data resources from a highly strategic point of view. This environment can be created by answering the following three questions completely and thoroughly:
 1. Collection: how do we collect data?
 2. Use: how do we use data?
 3. Disclosure: with whom do we share the data?

Cloud-based Platform

On the technical side, broadly leveraging water and energy utility data at the scale we envision is best suited for a cloud-based computing environment that provides the ultimate flexibility in accessibility, storage capacity and extensible processing power. Thus, the data policy discussion specifically included the context of a shared cloud environment. While cloud systems are commonly perceived as inherently representing a data security risk, advanced cloud services provide a number of safeguards for protecting data and have been certified to meet the majority, if not all, of the relevant State and Federal standards (see Appendices A and B).

During the discussion, it was stressed that the concept of having information in the cloud that would be accessible and available in multiple places at the same time presents a transformative opportunity to leverage value from complex and linked data sets and broadly improve data management capabilities within and between institutions. A number of obstacles exist in moving to a cloud platform, including: cost, technology, scalability, ability to manage security and privacy, processing time, human resource availability, legal jurisdiction issues, due diligence and cultural change. These issues were discussed in great detail throughout the afternoon breakout sessions on Day One, summarized below.

Breakout Sessions

Participants were divided into four breakout groups to promote active discussion between the different agencies and illuminate the perspectives they represented. The discussion was driven by the three key questions presented below. By answering these questions, participants were able to identify and outline some key elements of a draft roadmap towards the development of a cloud-based data sharing platform.

Where are we now? (Current state of data sharing, obstacles, etc.)

Participants in each breakout session discussed the various methods utilized by their respective agencies for managing data requests. It quickly became clear that no two organizations followed the same protocol for sharing data and some agencies lacked a clear protocol at all. In addition to the lack of a sector-wide standardized protocol, a number of additional obstacles to water utility data sharing were highlighted during the discussion, including: the broad heterogeneity of water agencies in California, the high transaction costs of individual project reviews and approvals, data fragmentation, lack of standardized systems for data sharing, and outdated IT infrastructure. Table 2 below provides a summary of these challenges.

Table 2. Five Existing Challenges to Data Sharing

Heterogeneity of Water Agencies	The data sharing challenge is compounded by the heterogeneity of water utilities in California that vary widely in size, availability of resources (monetary and institutional), IT sophistication, and customer communities.
High Transaction Costs	The process of establishing data transfer agreements and data collection often takes up a large proportion of the budget for each project (often as much as 50%). This situation can be attributed to the organizational barriers such as internal policies, and concerns over legal and financial liability.
Fragmented Data	The water sector is highly fragmented at multiple levels, in terms of both the data systems as well as institutional practices. The process of accessing data definitely represents a significant challenge for inter-utility work.
Lack of Standardized Systems for Sharing	Water utilities identified the lack of a consistent system to answer data requests as a major problem, while energy utilities gave examples of model practices such as the Green Button Alliance. The energy utilities pointed out that this program is already open to water utilities if they meet the IT requirements (but this can be very costly).
Outdated IT infrastructure	Using existing IT systems, ensuring data quality remains a challenge. This is especially the case in the context of increasingly large and dynamic datasets that require continuous updating.

Where are we going? (What are the components of an ideal platform?)

The purpose of this breakout session question was to identify some core characteristics that would be essential to the success of an integrated data sharing platform. Many of these components are interdependent with each other and are formulated to directly address the challenges outlined in Table 2 above. The key attributes identified by the group (summarized in Table 3) include: ability to integrate multiple data types, low transaction costs, advanced security systems, context-based frameworks for data sharing approvals, and coordinated vetting of data users.

Table 3. Key Attributes of a Successful Cloud-based Platform for Water-Energy Data Sharing

Able to Integrate Multiple Data Types	Ideally, the cloud platform would provide a wide array of information, including data on: customer consumption, time of use, outages, disruption recovery, SCADA systems, demand management, GIS, addresses, census blocks, water quality, neighborhood benchmarks, and so on. The California Irrigation Management Information Systems (CIMIS) managed by DWR may provide useful best management practices to implementation.
Low Transaction Costs	It was strongly stressed that a successful platform would significantly reduce the transaction costs to sharing data. This includes legal agreements, integration of data, and dealing with the politics within institutions. An integrated platform could enable consolidation of costs across multiple users.
Advanced Security Systems	The group envisioned a platform where the protection of the data could be largely entrusted to the platform service entity. Security improvements that were discussed included high-level cyber security technologies, differentiated access by user type, detailed auditing capabilities, and NIST and ISO compliance.
Context-based Approval Frameworks	One way to reduce transaction costs would be to standardize use cases into specific categories associated with readymade templates for data sharing. This would avoid the current scenario of developing “one-off” agreements and approvals for each and every project and data request. In concept, the number of templates would evolve with expanded number of use cases.
Coordinated Vetting of Data Users	Participants suggested that one approach to build trust between the data provider and the data user could be to create a consistent system for vetting data users (e.g. training or a reference system). This could streamline the lengthy process of developing a direct trust relationship with each user from external institutions.

How do we get there?

In addition to exploring where we are and where we need go, we leveraged the group discussions to develop tangible next steps for improving the data sharing process. The core activities proposed to advance the data platform concept, included: harmonized data standards, internal agency alignment, third-party platform management, and open-source platform design.

Table 3. Key Attributes of a Successful Cloud-based Platform for Water-Energy Data Sharing

Harmonized Data Standards	In data collection, there is a generalized need to develop a common water utility data model that can provide the foundation for developing common data standards. The participants agreed there should be a common lexicon for the process, both with file format and the way metadata is shared. This effort could be advanced by the creation of a bill or rule to establish the need, consolidate the regulations and shape the data sharing framework.
---------------------------	---

Internal Agency Alignment	Similar to harmonizing the data, the participating institutions will need to advance their internal data policies towards more holistic knowledge governance (described previously). An advanced platform will require each entity to streamline their internal data sharing procedures as well as improve their ability to assess the value of data sharing relative to the risk of sensitive information exposure and legal liability.
Open-source Approach to the Platform	Participants stated their preference that the platform be developed using open-source software. This would underscore the platform goal of generating a public benefit and potentially reducing total cost. Further, an open-source approach would allow for platform extensions to be designed and contributed by any participants/developers rather than be limited to internal upgrades and development within a private company.
Third-party Platform Management	Managing the platform seemed like too big of a task for any one utility. Participants also shied away from having the service be managed by a state agency. Thus, the group suggested that the platform management could be outsourced to an expert third-party agency. It was suggested that a non-profit entity might be best to enhance the trust relationship between participants.
Transfer of Lessons Learned	In terms of accelerating platform adoption by utilities across the state, it was stated that large utilities could take on some of the responsibility for sharing their knowledge and experience to help small utilities. Specifically, the large utilities could share lessons learned relating to the technological and institutional changes necessary to plug into the platform environment.
Mandated Platform Participation	Acceleration of platform adoption could also be driven by mandate from the state or federal government. However, there would need to be consideration of each state's right-to-know and data sharing laws as well as specific provisions for funding the mechanism through assistance funds for implementation.

DAY TWO DISCUSSION SUMMARY

Day Two of the workshop flowed from the Day One discussion in terms of taking a deeper dive into the data platform vision, specifically focusing on the potential benefits, the greatest barriers, existing best management practices (BMPs), and the roadmap for moving forward. Each of these topics was explored through panel discussions organized by sectoral perspective, including public policy, water utilities, energy utilities, and the private sector.

Benefits

Public Policy Perspective

The most obvious use of improved access to data in the public sector would be to inform the design, adoption, and evaluation of public policies to improve water use efficiency within a given jurisdiction. Taking water conservation as an example, improved access to data would greatly

enable better program targeting through improved customer segmentation and better program assessment through inter-utility performance benchmarking. Given the significant public benefit to accessing this data, it was suggested that consideration be given to leveraging regulatory methods to support and accelerate mechanisms for broadly sharing data and information between utilities and public agencies.

Another large benefit to public policy discussed in detail was the role of improved data to guide the development of new rate structures. As ongoing water conservation reduces water utility revenue generation, it is becoming increasingly important that the public sector and water utilities rethink rate design. Specifically, there is a need to create rate structures that promote water conservation while maintaining revenue stability. Decoupling revenue from sales as in the retail water sector can transform the view of water conservation from a threat to fiscal stability to a key operational opportunity. This transition would enable the sector to move away from crisis-driven conservation events to more predictable and consistent long-term water conservation plans. In rethinking these rate structures, ample data is indispensable. If public sector and water utilities had access to comprehensive data, it would greatly aid and expedite the rate design process.

There are many ways that improved access to data in the public sector can spill over to benefit other sectors. One significant use for the data can be to drive the market for new water-related business and technology ventures. However, the private sector has been hesitant to work in the water sector because of the existing complexity in policy and management issues. Thus, moving data collection and integration forward with regulatory action could thus increase the number of entrepreneurs working in the water sector. Public agencies could go even further and help directly mobilize the market by offering incentives for sharing data as well as for research and development of innovative, data-driven technologies.

Water Utility Perspective

The water industry is changing: there is a transformation in the way it looks at the breadth of its operations, from infrastructure optimization to customer outreach and communication. It is imperative to move beyond the traditional view of “adequate service” (in terms of safety, reliability, and affordability) by incorporating additional performance targets related to providing water in a more broadly sustainable manner. This includes developing a deeper understanding of how water systems connect to GHGs, embedded energy, environmental protection, social equity, and stakeholder participation. At the same time, these initiatives need to be carried out in a transparent, cost-effective manner. Understanding, balancing, and ultimately optimizing these multiple agency objectives fundamentally will require more robust data and analyses. Building on this perspective, the panel discussion centered on two key areas where improved information could drive meaningful change: systems optimization and community outreach and education.

Systems optimization

During the workshop, water sector representatives stressed the challenge of accessing the capital to expand and enhance infrastructure, as well as maintain their existing infrastructure. In the context of expensive capital investment, options for “smarter” systems operation can play a central role in reducing operational costs, managing existing assets, and postponing system expansion through improvements in system efficiency, in terms of both improved operations (e.g. leak detection, pressure management) and reduced customer demand.

On the infrastructure side of the meter, sensor technologies and analytical applications are enabling new opportunities for faster and more targeted responses to system disruptions and inefficiencies, including improved predictions of asset failures *before they occur*. However, the ability of water agencies to leverage these new tools still faces obstacles, most notably, the mobilization of scarce capital resources to implement new systems and the perceived risk of adopting new and potentially “unproven” technologies.

On the customer side of the meter, Advanced Metering Infrastructure (AMI) is enabling improved accuracy of meter readings; identification of customer leaks; improved understanding of temporal consumption patterns; reduced truck rolls (and attendant GHGs); development of district metering areas (DMAs); development of economic models of the elasticity of demand; and evaluation of the success of conservation programs in high-resolution (temporal and spatial).

Public outreach

Additional outreach and education is required to improve public understanding of their broader water systems with emphasis on understanding their linkages to infrastructure requirements, environmental impacts, and social needs. One key example is the lack of public understanding of the link between water rates and water conservation. Most notably, as fixed and variable costs increase in the context of water scarcity and demand reduction, customers are concurrently facing increasing water bills as their “reward” for their conservation efforts. This challenge needs to be tackled on two fronts: (1) improving rate design to appropriately balance revenue stability and customer conservation, and (2) educating the public that their water bill represents their contribution to support the water distribution system.

Outreach campaigns are also required to improve the public understanding of periodic drought. Focus groups in southern California have shown that some people felt the current drought was not really a drought, but rather a government-driven problem. Given the importance of engaging the public to collectively conserve water in the context of drought, developing an accurate public perception of drought events is essential. In this case, data external to the water utilities (precipitation, river flow, reservoir levels, and demand projections) can certainly be more effectively communicated to the public.

AMI has enabled identification of leaks upstream of the meter and improved customer communication. Improved communication allows customers to understand how much water they

use, how their usage fits within a water budget for their account, and how they compare to other accounts with similar characteristics.

Energy Perspective

Energy utilities recognize the great opportunities for collaboration with water utilities that arise around the water-energy nexus. It is important to acknowledge data sharing is critical for the success of any collaborative initiative between the energy sector and water agencies.

Embedded energy in water presents big opportunities in understanding the linkage between water and energy resources from both demand and supply sides. Data sharing, driven by regulatory channels, would help improve the tools and to continue building this data set for planning and decision making processes. Drought has ramped up this discussion: designing efficiency programs (not just energy efficiency) based on data can help us achieve the most ambitious goals in energy savings and GHG emissions reductions. However, more accessible data from both the water and energy utilities are required for advancement in this area.

Business Perspective

More robust and accessible data present a tremendous opportunity for the water sector to increase operational efficiencies by engaging with external solutions providers. Unfortunately, there has been only limited software or systems development from the business and technology sectors and even more limited adoption of these technologies by the water utility sector. The current drought has presented an opportunity for increased engagement between the utility and private sectors to jointly advance data management and analysis. This nascent relationship should be actively fostered and cultivated on both sides to realize the full potential of these partnerships, regardless of existing drought conditions.

In many cases, water utilities do not fully appreciate the depth of value of the information that is currently locked away in their data warehouse. There is an increasing amount of niche vendors that recognize the opportunity and are already offering solutions (e.g., WaterSmart Software). In fact, there are a lot of fascinating ways that smart data could be used in customer engagement. As an example, in a Fitbit world, we could have access to water consumption information and costs immediately, but we often have to wait one to two months for a paper bill to arrive in the mail. Access to real-time data can benefit the business, technology, and water sectors and now is the time for these sectors to reach out to each other to form successful long-term partnerships.

Barriers

Public Policy Perspective

One barrier to creating a comprehensive data platform is the outdated nature of much of the existing water infrastructure and its capabilities. For example, there are approximately 235,000 homes and business in California that still lack even basic water metering. Many utilities are still in the midst of installing meters in the attempt to meet the state mandate, AB 2572, requiring

urban water utilities to have all meters installed by 2025. For households that are currently metered, many are still analog and thus do not have the full capabilities of providing utilities with the data needed at the required speeds. Compared to electricity smart meters, this lag in infrastructure poses an impediment to providing management opportunities across the water and energy sector.

Another issue that has stifled data sharing within the water sector has been data privacy. The current public perspective is a general wariness towards sharing detailed data between agencies. As policies are made in this area, all stakeholders will need to contribute to the discussion, and it is hoped that an effective process could lead to a greater level of comfort with data sharing. To advance this agenda, efforts will need to be made to advance technologies that provide protection and to educate institutions and consumers about the relative risks and benefits of data sharing.

Water Utility Perspective

In the water sector, a number of critical barriers exist that currently prevent the fluid transfer of data between multiple parties. A few of the barriers highlighted in the discussion, include:

- no single agency wants to take responsibility for managing the data sharing logistics;
- most agencies have a general lack of trust in sharing data with external partners; and,
- there is a general lack of clear regulatory guidance.

In response to these collective barriers, the question was asked: “How do we share data and transition to a true data sharing platform – a platform that could lead to a distributed database, managed not by one person but by all the participants?” It was suggested that a consortium of utilities could employ a trusted third party to take responsibility for putting the data sharing network into place. This “early mover” consortium could provide sample data from multiple departments to enable the buildout of a standardized and integrated data model, and eventually database, for relevant utility data types.

Another challenge brought up during the discussion was that even though a lot of data is already collected by water agencies, it is often not properly nor completely analyzed. Where possible, data experts should be embedded within the water agencies to “build and live” the process of advancing the utility to a new phase of information management. However, this will be a significant obstacle to smaller water utilities that do not have the resources to develop internal IT departments. Thus, in their case, participating in a data sharing consortium potentially represents even greater benefits over the *status quo* than for some of the larger utilities that are able to accomplish more with their in-house capacity.

Energy Perspective

From the energy perspective, the main barriers to streamlined data sharing include the overall transactional costs and delays embedded in the process, most notably:

- the outdated technology inherent to legacy IT infrastructure systems;
- the availability of human resources to process the data requests; and

- the time spent in setting the legal and contractual agreements.

Further, the water sector is still behind in the implementation of AMI. Increasing these resources are very challenging because not only is the implementation of the technology required but so is the training of personnel to deliver the information requested by external collaborators (e.g. energy utilities, neighboring water districts). Further, since the utilities must bill customers every one or two months, they cannot afford to experience a long lag time in transitioning from one system to another.

Finally, there is a general mismatch in scale between the few, generally large energy utilities, and the many, relatively small water utilities. The large energy utilities often cover territories that are shared between many small water utilities or districts and it is hard to plan and coordinate the work regarding data sharing and analytics across so many different institutional partners.

Business Perspective

There are several barriers that were identified during the workshop. First, panelists outlined some obstacles keeping investors from investing in new technologies and businesses within the water sector. Because water is such an inexpensive commodity, investors question whether they can make a return on their investment. Investors are also concerned with the fact that water regulation and policy are so inconsistent, depending on local geography and resources. These inconsistencies make it difficult for investors to know whether technologies will be profitable when scaled up and applied to different regions with California.

Another challenge for the business and technology sectors is that municipalities are not always willing to share their data. Different cities value their data differently. There is a struggle between two schools of thought: should they protect their data and leverage it privately, or should it be treated as an open source resource? Often, the challenge is that the cost of processing and acquiring data is greater than the perceived return on leveraging that data. Open data may not be the solution but we need to synergize and build the connections. Also, when the data platform is established we need to understand what are we optimizing for since not everyone will agree on the proposed objectives. One thing that should be looked at is whether the right questions are asked to drive the data sharing relationship. The answers we find are fundamentally based on the questions we ask. Until we get a shared understanding, it will be difficult to design effective solutions through technology.

Best Management Practices

Public Policy Perspective

There are many current examples that demonstrate the success of integrating data. The California Solar Initiative, a solar rebate program for California utility consumers, prompted the development of an online database and tool by the California Energy Commission (CEC) and California Public Utilities Commission (CPUC) to publicly share solar installation data (omitting



names and addresses). Within a couple of years, this data identified key information that helped individuals in the market innovate products for consumers. This program may be able to provide lessons learned for how to develop a cloud platform for public benefit purposes.

Another program supported by the state is the Prop 39 initiative. Schools receiving grants are asked to share their energy consumption data with the CEC, which will ultimately be made public. While the state still needs to consider the appropriate quality controls to preside over this data, the Prop 39 program could potentially serve as a model for entities who receive state funds to support transparency and accountability.

Recently, Los Angeles Department of Water and Power (LADWP) partnered with Southern California Gas (SoCal Gas) to identify energy efficiency improvement opportunities. SoCal Gas found many leaking hot water heaters that were wasting large amounts of natural gas and water. At a time when a natural gas shortage may be imminent in the state, it is important for the utility to identify these leaks in the system, which have co-benefits for water and energy savings.

The CPUC has also recently developed a water-energy nexus calculator that helps energy utilities calculate their embedded energy in water. Energy intensities vary greatly across the state, as well as within a single hydrologic region. By quantifying the energy, GHG savings can also be derived. The energy intensity of sourcing, moving, and treating water within a utility's service region can provide insight into where energy efficiency measures implemented may result in significant GHG savings. The Climate Registry is also piloting a protocol for their members to calculate their GHG intensity to evaluate how much GHG from water attributes to their overall inventory of emissions.

Finally, the California Irrigation Management Information System (CIMIS) is a good example of a program that monitors, collects and uses data to improve irrigation systems in the agricultural sector. The Department of Water Resources (DWR), in collaboration with UC Davis, developed this program to facilitate data access to farmers and help them make decisions regarding irrigation management. CIMIS serves as yet another model of delivering widespread benefits through data integration, analysis, and outreach.

Water Utility Perspective

The California Data Collaborative provides a recent (est. 2016) example of a multi-agency data sharing and analytics consortium. The water agencies participating in this initiative felt that they needed to share and understand their data better to proactively help shape state policy on agency-specific conservation targets. This bottom up approach, coming straight from the utilities themselves, is essential for developing the necessary utility "buy-in" for creating a broader data platform. The long-term goal of the Collaborative is to create a platform for streamlined data sharing.

Energy Perspective

Investor owned energy utilities agreed that there are a number of lessons learned and best practices in the energy sector that could inform the water sector. As an example, utilities in the energy sector have been able to use data to target customized program solutions to their customers for many years. Bringing all the water stakeholders together around a set of common goals and programs is a big endeavor, especially given the large number of small water utilities in CA. Thus, clearly identifying the potential benefits of developing institutional and infrastructure synergies in the sector will be essential for mobilizing broad-based support. In the public sector, Southern California Public Power Authority (SCPPA) is an example of how this relationship can be articulated. SCPPA provides coordination and facilitates the implementation and communication between 12 public power agencies in joint action services. Northern California Power Agency (NCPA) provides similar coordination between 12 members (including utilities and cities) in the north as a non-for-profit power agency.

Business Perspective

The business sector has a lot of experience with managing data from different technologies. One company with such experience is General Electric (GE), which has recently invested in a software center of excellence to manage data from all the different technologies they support. An area where GE is demonstrating leadership is the oil and gas sector. Similar to the water sector, the data regarding oil and gas was highly disconnected and fragmented. GE took the effort to streamline and connect all their data to create a centralized platform to more clearly analyze both opportunities and risk in the sector. GE is already looking to create a similar platform for managing water data. Numerous examples exist where diverse business and technological solutions have been transferred across sectors, and an integrated data platform is no exception. It is important that best management practices be taken from other sectors that have achieved success in this area and applied to the water sector as data becomes more available.

Moving Forward

Public Policy Perspective

Establishing a cloud data platform will undoubtedly have a fiscal impact on water utilities. Such an investment in infrastructure requires cost recovery, and this will be an important part of the policy discussion, in particular for smaller utilities who already lack the financial and human resources that larger utilities may have. It is also crucial to educate the public about utility costs, both fixed and variable. As the drought has demonstrated for some customers, conservation may not necessarily be commensurate with reduced rates. In future droughts, it will be a challenge to incentivize reduced use while maintaining sustained revenue to safely provide drinking water.

Water Utility Perspective

For water utilities, there is a desire to increase the availability of water data statewide. One cannot manage what is not measured. Without access to quality data, it is impossible to make informed management and policy decisions. There is a need for a secure cloud based platform and significant expertise to analyze data to produce actionable information for decision-making. In developing the platform, it will be important to recognize: (1) sharing data involves trust and having a generally accepted set of provisions associated with the platform that instill trust will be important; and (2) the value of sharing data on the platform needs to be readily apparent.

Energy Perspective

When thinking about data sharing, the question to be answered is: what is driving the data? Energy and water utilities are pooling this data because they are trying to benefit people and their organizations. The water-energy nexus affects the same people, so looking at co-benefits would guide both in the same direction. Ongoing discussion to align stakeholders around a common vision would help to clearly identify the needs, solutions, and benefits of a data sharing context. At the same time, reducing transaction costs of sharing data is an appropriate place to focus joint efforts to streamline the process.

Business Perspective

A strong vision for the future is widespread water data sharing across California. California is no stranger to technological excellence but our water intelligence is lagging. If we had more comprehensive and accessible data, all sectors could benefit from more advanced analysis of this data. Data has increasing value in this technological age, and it is important to understand that we cannot necessarily foresee every benefit of acquiring all of this data. There are second and third order effects of collecting such data; uses that cannot yet be foreseen.

The private sector carries the burden of demonstrating the specific value of the solutions they have to offer. The legal structure, policies and regulations surrounding the water sector are difficult to navigate. Further, the cost of scoping out the value of particular information-based hardware or software solution carries significant transaction costs in terms of adapting the

potential benefits to the context of individual water agencies, which vary widely. This presents a significant obstacle to the marketing, and ultimately the adoption, of these technologies in the water sector. With a common, standardized data platform, data could be more easily queried and transferred to external partners hoping to deliver effective solutions to the utilities. As we move forward, it will be important for the public sector to establish policies that create a landscape where creative business solutions can flourish. There are major opportunities for investment and entrepreneurship within the water sector but it will require some work from the public sector to attract significant investment.

Conclusion and Next Steps

It is important for water utilities to use resources in a thoughtful and effective way; they need to evaluate their resources and be aware and adapt to what is and is not working. It is becoming increasingly important in the water sector to share data: the technology exists, but the entire sector needs to come together and adapt to an improved framework to accomplish common goals in an effective way. For example, many studies on water conservation have been carried out, but the availability of water data is still limited, making it difficult to create and implement policies. By pooling data together in a platform, utilities can assist the research sector to formulate scientific knowledge that can help with decision-making. Sharing studies between utilities can improve operations, a need highlighted by current drought conditions.

In response to the California's Governor's Executive Order on urban water conservation, water utility data has been mobilized and utilized to inform policy makers to a greater extent than ever before. These data flows need to be bolstered so that as populations increase and resources become more limited, better decisions can be made in a timely manner. In addition, there is a rising public demand for data and a desire to make data accessible, understandable, and actionable for customers.

However, there are many barriers that exist when it comes to sharing data between water and other utilities. This is in part due to customer privacy issues that arise when sharing data with each other. Even though, in many cases, utilities share the same customers and already have access to the protected information, current laws and policies make data sharing difficult and costly. As data sharing is streamlined, privacy needs to continue to be protected and trust needs to be built between utilities. In addition to privacy concerns, data sharing has been hindered by the way that data is managed within water companies. In most cases, water data is highly fragmented and data collection and management practices vary greatly. A standardized format of data reporting will be required to leverage existing information across utilities.

As the water sector moves forward to sharing data more frequently, it is important to learn from pioneers within the water sector and from other utilities that have more experience managing data. In particular, the energy sector provides much insight into how water utilities can more effectively manage and share data. Energy companies currently have more streamlined data management and sharing processes. It is likely that both the water and energy sectors will

continue to streamline data management and sharing as data leveraging becomes progressively more important to stakeholders and decision makers. As technological advances continue to be made in data analysis, this data will become even greater value in managing our vital resources.

Next Steps

It was clear from discussions within this workshop there is a desire to streamline the data sharing process and that a data sharing platform would be highly beneficial in creating value from the collective data. Moving forward, the details of creating a data sharing platform need to be carefully considered. The platform should be designed to ensure privacy while at the same time increasing accessibility within trusted parameters. It needs to be determined how much data will be shared and in what way will different entities have access. Another key to creating this data-sharing platform will be to build increased buy-in from all parties involved.

A logical outcome of the workshop appears to be the establishment of a formal consortium of water utility participants that can collectively scope and actually begin to build a demonstration version of the data-sharing platform. By working through the details of establishing a functional data platform, the participants can engage in additional discussions and re-evaluations will be necessary to better perfect a solution to the water sectors' rising data sharing needs.

At a minimum this early version of the data sharing platform should provide the following capabilities:

- Organization and integration of multiple data types from multiple users. Fundamentally, the pilot cloud platform will be designed to ingest multiple data types from multiple sources. These data will be provided by the consortium partners, and contributions can progress from public towards more private data as the security capabilities of the platform are built out.
- Advanced data security protection. The pilot platform would be designed to meet core NIST and ISO standards over which additional layers of security can be built to meet the needs of "use cases" as they arise within the consortium. These security systems will be tested and verified for compliance with the security and privacy requirements identified by consortium participants.
- Emerging Water System Data Model and Standards. As data are provided by the participating utilities, the group can begin to map out the commonalities in data structures. These commonalities will be used to build an emergent data model for water utilities and converge towards more universal data formats and standards.
- Establishment of "Use Case" Library. Over the course of the workshop, we learned that most water agencies approve data releases on a case by case basis. To streamline this approval process, the consortium should aim to develop a library of use cases, categorized by use type and linked directly to appropriate security and approval processes.

- Differentiated Access within a Cloud Environment. As different users, both internal and external to a water utility, need to be granted different access to data, the capability to differentiate this access needs to be embedded in the cloud platform.
- Harmonized data sharing protocol. Throughout the platform development, all data sharing standards, regulations, and legal requirements related to the pilot data and its use should be reviewed and harmonized within a collective data sharing protocol adopted by all members of the consortium for the sake of transparency and streamlined participation.
- Development of Core Applications (“Apps”). Along with building out the data storage, security, and sharing capabilities of the platform itself, the utility partners within the consortium can suggest specific tools or analyses that they would like to have built into the platform environment. These ideas will be developed for individual agencies and then propagated to other users on demand. In this way, an ecosystem of analytical apps can be rapidly developed and shared across the users.

This initial pilot effort will provide the seed platform and data sharing protocol for rolling out a broader data sharing initiative. Of course, this proposed endeavor would be a rather resource intensive process, requiring strong and transparent trust relationships to be established across all partners. Ultimately, to expand participation in the platform, there will need to be a concerted effort from the public and private sectors to move data sharing forward. However, it is possible the platform may quickly develop value beyond the cost to participate. For example, once the data platform is operationalized, the “early mover” water utility consortium partners should be able to leverage value directly through increased partnerships with the business and technology sectors to analyze and use this data to provide niche solutions to water issues.

Appendix A – Data Types and Information Classes

Types of Data for a Water and Energy Data Platform

Participants should envision a cloud-based data architecture that can incorporate a wide range of data types (e.g. relational data, spatial data, time series data, and metadata) from multiple sources. Examples include, but are not limited to:

- Utility data: operational and asset data (SCADA and network design), consumption and billing data, water quality testing results, energy meter data
- Socioeconomic and demographic data: census data, disadvantaged communities (DAC) data
- Building characteristics: assessor parcel data, Google earth data
- Social networks: social media data
- Environmental: land use; air and water pollution data; spatially downscaled climate model projections

Information Classes

Spanning across these data examples, it is worth distinguishing between information class and data types. There are four broad classes of information: protected consumer information, protected business information, Controlled Unclassified Information (CUI), and public information. Within the context of CUI, two key sub-classes of data include critical infrastructure information (CII) and protected critical infrastructure information (PCII).

CII is defined as data relevant to the core operations for a sector "whose assets, systems, and networks, whether physical or virtual, are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof." [1] The water and wastewater sector is one of the 16 CII sectors [2] identified by the Department of Homeland Security (DHS).

There are different and distinct definitions of personal information in protected classes within the U.S. Within the context of CII and PCII, water or energy utility customers' personal information is included under the broader umbrella for PCII-qualified functions. PII, as defined by the U.S. General Services Administration (GSA), is "information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, etc. alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name, etc." [3] Public data are generally broadly available to the public. It is important to note, when public information is joined or merged with CII or PCII, the information class becomes "Sensitive But Unclassified" (SBU) and the data type is transformed to CII or PCII respectively. The same is true for other classes of information. However, DHS has specific procedures in place for ensuring protection of proprietary and sensitive business and personal information. While public

data do not represent a significant challenge in terms of security and privacy on their own, there is great potential to improve the accessibility of public data through improved integration of information across relevant institutional departments and datasets. PCII information is part of an overall strategy that includes not only management of relationship with government, but also how that flow of information is managed, that can bring benefits to the private sector, its government partners and contribute to carrying out activities that promote safety.

There are different types of information objectives and sharing purposes that can be placed into three groups:

1. Internal Operational Practices (IOP): focuses on collection, use and disclosure of information within a firm, in order to improve one's internal business functioning, or 'bottom line'. This information is considered confidential.
2. Commercial Data Processing (CDP): focuses on sharing information for commercial gains, usually with third parties. This information is considered private.
3. Protected Critical Infrastructure Information (PCII): focuses on how we maintain secrecy and privacy of a certain type of critical information, and protect it.

PCII Standards

The concept of PCII has its origins in the Critical Infrastructure Information Act of 2002[4], which created the Protected Critical Infrastructure Information Program that enables members of the private sector and others to voluntarily adhere to the standards set forth by the Department of Homeland Security (DHS) with the assurance that sensitive public, business, personal information will be *protected* from inappropriate and unauthorized disclosure.[5] For details see the PCII Procedures Manual[6]. The objective of the program is to encourage the private sector to voluntarily give information to the government about the 16 critical infrastructure sectors so that the government can protect that information.

The PCII program requires periodic training from DHS for any employees or contractors with access to PCII in both the public and private sectors. [This ensures that "only trained and certified Federal, State, and local government employees or contractors may access PCII."][7] Further, the federal guidelines for accessing PCII data depend on whether the purpose of using the data is directly related to improving the security of critical infrastructure systems (which we refer to as "PCII qualified purposes").

PCII qualified purposes broadly include efforts to:

- Analyze and secure critical infrastructure and protected systems.
- Identify vulnerabilities and develop risk assessments.
- Enhance recovery preparedness measures.

Under the framework of the PCII program, any entity seeking to access PCII must adhere to PCII Procedures requiring a data security framework and controls to meet the following seven standards:

- Framework for Improving Critical Infrastructure Cybersecurity (NIST SP 800-171)[8]
- Control Objectives for Information and Related Technology (COBIT)[9]
- Council on CyberSecurity (CCS) Top 20 Critical Security Controls (CSC)[10]

- Security for Industrial Automation and Control Systems: Establishing an Industrial Automation and Control Systems Security Program (ANSI/ISA-62443-2-1 (99.02.01)-2009)[11]
- Security for Industrial Automation and Control Systems: System Security Requirements and Security Levels (ANSI/ISA-62443-3-3 (99.03.03)-2013)[12]
- Information technology: Security techniques: Information security management systems: Requirements (ISO/IEC 27001)
- Security and Privacy Controls for Federal Information Systems and Organizations, April 2013 including updates as of January 15, 2014 (NIST SP 800-53 Rev. 4)

Thus, in the event that an entity is "trained and certified" under the PCII Program, meets the data security framework standards listed above, and their proposed use of the data is deemed to be in line with "PCII purposes", then they can receive full access to the relevant PCII.

Importantly, the PCII designation protects the data recipient from the complex landscape of data privacy standards and requirements that exist for non-PCII data handling (see section on non-PCII standards and requirements below). Further, the PCII classification provides preemptive relief from:

- The Freedom of Information Act (FOIA)
- State, tribal, and local disclosure laws
- Use in regulatory actions
- Use in civil litigation

The PCII Program provides protection against civil litigation (not criminal). It cannot be used for regulatory purposes. It is not a mandated or regulated program; it is a voluntary program. The PCII program has become very successful in getting private sector to give information.

During the two-day workshop, the value for the private sector of the PCII came through:

- There are vulnerability gaps in the 16 critical infrastructure sectors. The government has been able to assist and inform the private sector, to mitigate and recover from vulnerability, should they have man made and/or natural disasters.
- The PCII program can also help prepare and respond, and provides notifications and warnings for natural disasters (e.g. Katrina, Sandy, influenza)
- DHS can analyze the infrastructure and they can use these analyses to inform decision makers at all levels, about the interdependencies. Where the most significant vulnerabilities are. It helps make plans for recovery, and resiliency.
- The information from PCII is also used for providing safety for inauguration events and to help plan for national events (e.g. political, sports, music)
- The information from PCII comes from all 16 sectors, like chemical or health. They have over 115,000 submissions. Thus, the program can support the private sector by enabling them to come together, through common interests, and learn from each other.
- Government entities at all levels are getting better info about the infrastructure, and it helps solve some of the challenges in protecting infrastructure



- The private sector is becoming accustomed to PCII program and so they are getting better quality information to help decision makers protect infrastructure

Categorical Inclusions

Categorical inclusions are becoming very popular under PCII, and were discussed at the workshop as an option to share data within a group. Categorical inclusion is a prevalidation of the CII that is submitted. The PCII office, the infrastructure facilities that are involved, and the program officers, the DHS and other involved people, come together when they have decided that there is something of interest related to a specific infrastructure, and they want access to it together and they want it in a short space of time. This allows the information to be prevalidated; there are a set of questions, and they determine when the response goes in, it's going to be PCII. The data is shared usually in an electronic environment. There is a program manager designee responsible, the individual is responsible to make sure that the info is properly PCII, and sends metadata to DHS. Categorical inclusions are currently active only at the federal government, but the government is looking to expand them to state levels.

It was mentioned in the workshop, that if information wants to be shared in a short amount of time, categorical inclusions can be very effective, but it does require partnership with a federal agency.

In concept, if there was a group of water utilities interested in sharing data in California, they could form an Information Sharing and Analysis Organization (ISAO), and could apply to a categorical inclusion, such that they could share data quickly and it would be designated as PCII.

Non-PCII Data Standards

Unlike the relatively clear framework the DHS provides for PCII, there is no comprehensive legal framework in the U.S. for personal information, nor is there a single standard for an organization's information security diligence. However, the question remains, what are the guidelines for sharing data when utilities would like to partner with external agencies for data analysis that does not meet the requirements of PCII purposes?

The overarching answer to this question is that "it depends". There exists a diverse, overlapping, and complex patchwork of regulations and standards at the federal, state, and institutional levels relevant to the sharing of non-PCII (see Appendix A). The relevance and application of most of these standards and regulations is highly context specific, i.e. it depends on the source and type of the data, the data subject, the data user, and the intent of the analysis. Each utility needs to consider each project or analysis individually, placing a significant burden on the management and/or legal department to review, assess, and develop a customized response to each and every external data sharing agreement. A key focus of this workshop is for the participants to discuss and develop solutions for potentially reducing the scale of these transaction costs for broader data sharing efforts.



In sum, the distinction between PCII and non-PCII purposes is significant because the related data security and data privacy requirements for entities seeking to access the data differ significantly between these two categories. Most importantly, the Critical Infrastructure Act of 2002 provides preemptive relief for PCII that would otherwise be defined as 'personal information' under other federal and state privacy laws. Thus, utilities seeking to partner with external agencies on efforts that align with PCII purposes should consider leveraging the PCII framework to build trust and streamline engagement.

Appendix B - Federal and State Authorities for Non-PCII

The following lists only a sample of Federal and State Authorities relevant to sharing utility data for non-PCII purposes is meant to be illustrative and not comprehensive. Ultimately, the list is intended to illustrate the patchwork of existing standards and regulations that exist regarding the use of sensitive business and personal information utility companies must consider outside the realm of the PCII Program.

Non-PCII Federal Authorities

1. Federal Trade Commission Safeguards Rule, 16 C.F.R. Part 314
2. FACTA Disposal Rule, 17 C.F.R. §248.30
3. GLBA privacy of consumer financial information, 16 C.F.R. Part 313
4. Fair Credit Reporting Act's consumer credit protections, 15 U.S.C. §1681 et seq.
5. Red Flags Rule, 16 C.F.R. Part 681, and Regulation S-ID: Identity Theft Red Flags, 17 C.F.R. Part 248, Subpart C
6. Fair and Accurate Credit Transactions Act Affiliate Marketing Rule, 16 C.F.R. Part 680
7. Right to Financial Privacy Act, 12 U.S.C. §3401 Federal et seq.
8. Federal E-Sign Rule, 27 C.F.R. Part 73
9. Sarbanes-Oxley Act, Pub. L. No. 107-204
10. Internal Revenue Code, confidentiality of return information, 26 U.S.C. §6103
11. Federal Trade Commission Act Section 5, 15 U.S.C. §45
12. Children's Online Privacy Protection Act (COPPA), 15 U.S.C. §6501 et seq.
13. Controlling the Assault of Non-Solicited Pornography and Marketing Act (CAN-SPAM), 15 U.S.C. §7704 et seq.
14. Federal Communications Commission and the Telecommunications Act of 1996, 47 U.S.C. §222 et seq.
15. Federal restrictions on commercial mobile service messages, 47 C.F.R. §64.3100 et seq.
16. FTC Do Not Call Law, 47 U.S.C. §227 and Telemarketing Sales Rule, 16 C.F.R. Part 310
17. Telephone Records and Privacy Protection Act (TRPPA) of 2006, Pub. L. No. 109-476.
18. Video Privacy Protection Act, 18 U.S.C. §2710
19. Subscriber privacy under the Cable TV Privacy Act of 1984, 47 U.S.C. §551
20. Driver's Privacy Protection Act, 18 U.S.C. §§2721-2725

21. HIPAA Privacy Rule, 45 C.F.R. Part 160 and Part 164, Subparts A and E
22. HIPAA Security Rule, 45 C.F.R. Part 160 and Part 164, Subparts A and C
23. HIPAA Breach Notification Rule, 45 C.F.R. §164.400-164.414, and FTC Health Breach Notification Rule 16 C.F.R. §318.2

Non-PCII State (CA) Authorities

1. Financial Privacy Laws
2. Use and security of Social Security Numbers
3. Credit freeze laws
4. Use of credit card information
5. Internet and mobile privacy policies and other privacy-related disclosures
6. Data breach notification
7. Minimum data security measures
8. Spyware
9. Do-not-call and do-not-fax
10. State pretexting laws
11. Commercial e-mail and spam
12. Commercial texting
13. Employer use of consumer/credit reports
14. Employer monitoring of employee e-mail and Internet access
15. Employer use of employee social media accounts
16. Data destruction and records disposal
17. Uniform Electronic Transactions Act
18. Radio Frequency Identification (RFID) and tracking devices
19. Anti-phishing laws
20. Do-not-track laws
21. Student online privacy
22. Encryption of personal information

[1] DHS, What is Critical Infrastructure: <https://www.dhs.gov/what-critical-infrastructure>

[2] Department of Homeland Security, Critical Infrastructure Sectors (Presidential Policy Directive 21 lists 16 critical infrastructure sectors: chemical, commercial facilities, communications, critical manufacturing, dams, defense industrial base, emergency services, energy, financial services, food and agriculture, government facilities, healthcare and public health, information technology, transportation systems, water and wastewater systems, and nuclear reactors, materials, and waste). <https://www.dhs.gov/critical-infrastructure-sectors>

[3] U.S. GSA website: <http://www.gsa.gov/portal/content/104256>

[4] Critical Infrastructure Information Act of 2002 (<http://www.dhs.gov/publication/cii-act-2002>), presented as subtitle B of title II of the Homeland Security Act (§§211-15), codified at 6 U.S.C. §§131 et seq.

- [5] PCII Protections Disclosure: <http://www.dhs.gov/pcii-protections-disclosure>
- [6] PCII Procedures Manual: <http://www.dhs.gov/sites/default/files/publications/pcii-program-procedures-manual-508.pdf>
- [7] Department of Homeland Security, PCII Program: <https://www.dhs.gov/protected-critical-infrastructure-information-pcii-program>
- [8] United States Department of Commerce's National Institute of Standards & Technology (NIST), Framework for Improving Critical Infrastructure Cybersecurity (Feb. 12, 2014): <http://www.nist.gov/cyberframework/upload/cybersecurity-framework-021214.pdf>
- [9] COBIT: <http://www.isaca.org/COBIT/Pages/default.aspx>
- [10] CSC: <http://www.counciloncybersecurity.org>
- [11] ANSI/ISA-62443-2-1 (99.02.01)-2009: <http://www.isa.org/Template.cfm?Section=Standards8&Template=/Ecommerce/ProductDisplay.cfm&ProductID=10243>
- [12] ANSI/ISA-62443-3-3 (99.03.03)-2013: <http://www.isa.org/Template.cfm?Section=Standards2&template=/Ecommerce/ProductDisplay.cfm&ProductID=13420>

Themes and Questions

There is value in improving access to water and energy data by utilities, customers, businesses, government and educational institutions for the optimization of water and energy conservation, management, decision making and resource use. Water utilities perhaps don't appreciate the potential impact that greater data accessibility could provide to the utility's decision-making process as the power of data has yet to be fully unlocked in the water sector. A predominant reason for the water sector's lacking data is the manual meter reading system that is currently in place, if there is a meter reading usage and producing data at all. This California policy legacy is challenging to correct as the expense of infrastructure upgrades is challenging to support without evidence. Producing evidence through data usage is challenging in a risk adverse industry. The challenges presented to the State of California have changed that calculation dramatically. And Governor Brown has systematically promoted the use of technology and data driven decision making throughout his tenure as head of state.

1. What should the CPUC do to develop, create, produce, more data for system and customer use and analysis? What data are required to make better decisions? How can the CPUC consider privacy and cyber security in procuring and distributing water system data? If relying on rules for electricity utility, are there differences that should be accounted for in the area of water?
2. Should the CPUC convene workshops and working groups to determine an appropriate process for procuring water data? What types of outputs should these workshops and working groups develop? For what purpose?

3. Should the CPUC tackle the area of data harmonization, harmonization of data reporting? How can data access increases, data management, data analysis optimize water systems, water management, water conservation, energy conservation? How can this information be more broadly used? Where can this water system data be found? How do we increase the amount of water system data in existence for better business, regulatory, customer decision-making?
4. How can we increase energy utility knowledge of water utility system and processes to encourage water and energy conservation and increased collaboration across the utility spectrum? Does access to internet impact the ability to optimally manage water and energy? If so how? How can the CPUC level the playing field so that participants can assist in the optimization of water and energy management with the appropriate signals?
5. How might an integrated water-energy data platform promote better decision-making by water and energy utilities to increase resource efficiency and reduce greenhouse gas emissions? Where might be the appropriate place to develop such an integrated data platform? Should the CPUC order a meet and confer among energy and water utilities to come up with categories for such a platform? Would paper comments be preferable? What is the equivalent of the distributed solar system to the world of water? What could be the equivalent of the solar installation data set developed through the Million Solar Roofs program?
6. Energy utilities utilize data to target customized programs at customers. What types of programs can the water utilities or water and energy utilities together target? What additional data would be needed to be used to further customize programs for customers? What are some innovative ways for the business sector aid the water sector in data management without necessarily impacting the water ratepayer? Are there partnership possibilities? How can these collaborations be promoted and driven to produce results?
7. Please comment on the feasibility of the three stages of data platform governance maturity.

8. One cannot manage what is not measured. Please propose some innovative solutions to overcome existing challenges in data sharing.
9. In the often heard request for flexibility in the water sector, please describe with specificity the differences in water utility capabilities that would need to be taken into account when requesting specific data sets. Please describe, by utility or water authority, what barriers to delivering data exist and thoughts about how to overcome those barriers.
10. Water utilities collect large quantities of information as part of their operations. Would sharing this information with entities outside the water agency enable improved analytical products and economies of scale in data management in one or more of the following areas? If so, how?
11. How can the CPUC help collaboration within and across utilities, as well as with the range of other stakeholders?
12. Pursuant to Governor Brown's Executive Order B-37-16, water utilities are directed to improve utility system performance, including leak loss detection and repair, pressure management, and prioritization of projects within capital improvement programs. What is the most effective way of accomplishing this task? What is the most cost effective way of accomplishing this task?
13. What steps need to be taken to accomplish the following tasks inside each utility – please be specific about barriers between utilities: (Please do not address utilities collectively if there are individual differences, please specify the differences by utility specifically.)
 - Should utilities benchmark water and energy use across customers, customer classes, and utilities?
 - Should utilities assess the effectiveness of demand management strategies within a utility and across utilities?
 - Should utilities improve the effectiveness of data generated from AMI systems?
 - Improve demand forecasts for water wholesalers
 - Streamline and standardize reporting to the California Urban Water Conservation Council, state agencies, and other agencies and organizations
 - Provide collective input to the State Water Resources Control Board (SWRCB) and other decision makers

- Better understand the impacts of various conservation actions including but not limited to rebates, public education, and marketing
- Evaluate the effectiveness and equity of different rate structures and propose differences in upcoming GRCs?
- Assess the effectiveness of utilities' responses within a particular utility as well as across utilities to past and present state mandated actions?

14. Water utilities, please identify the current data points currently collected for decision-making purposes. (Each utility should provide a separate answer as each utility internal structure is different.) In your response please:

- Identify gaps and challenges in data collection and management
- Merge utility data with data outside the utility (e.g., account-level water or energy use with U.S. Census data) to explore a broad range of hypotheses and questions
- Address the types of data needed to support and shape future state actions
- Indicate and address the type of information that would drive innovation in the water and energy sectors
- What are water agencies' current policies and practices of sharing data with entities outside the agency?

15. If the Commission were to issue a ruling broadening the sharing of data collected by water utilities, what does an advanced data sharing system look like to you? Should water utilities be required to provide information to any requesting parties meeting certain requirements (such as is done with energy IOUs through data portals established in response to the 2014 ruling, or should access to water utility data be managed by a separate entity, such as a not-for-profit organization?

16. Do you see a cloud-based data platform as an acceptable mechanism for sharing data? What are the pros and cons of this approach? Are there alternative approaches?

17. What types of security and privacy provisions need to be in place for an entity outside a water utility to receive water utility data? If appropriate, provide a response in reference to specific data classes (e.g., personal

identifiable information, critical infrastructure information, SCADA data, etc.).

18. What are the main obstacles that currently limit your ability to share data, and how can these obstacles be overcome?

19. From the following list, please identify from 1-5 (1 being easy, 5 being challenging) how putting together a database of the following information would be, per utility. If the response is 3, 4, or 5, please indicate the barriers to obtaining this information and 3 suggested ways that the utility could procure this information.

A. Data for utility water service customers (residential, commercial, industrial, institutional, etc.) corresponding to water usage organized according to service address including nine (9)-digit ZIP (ZIP + 4) codes. Data can include, but is not limited to:

- Account number
- Address
- Power consumption
- Water consumption
- Class code
- Zone
- Assessor Parcel Number (APN) from County Assessor
- North American Industry Classification System (NAICS)
- Census tract and/or block Federal Information Processing Standard (FIPS) codes
- Latitude and longitude
- Lifeline and low-income

B. Utility data, including, but not limited to:

- Potable/drinking water extraction, storage, treatment, and provision: information on total water extraction (and purchases), storage, treatment, and provision (not including provision data or other data regarding individual customers) by the water utility occurring in reporting periods.
- Geographical Information System (GIS) and Computer Aided Design (CAD) data: GIS and CAD data specifying the water infrastructure network configuration and asset location.

- Asset data: data on water infrastructure assets, including but not limited to component type, age, material, make, model, and replacement history.
 - Energy use: data on energy use by individual energy meter for the water utility (but not for individual customers).
 - Supervisory Control and Data Acquisition system (SCADA) data: all data logged in the SCADA, e.g., flow, pressure, energy, and chemical inputs.
- C. Conservation: all data on water conservation programs, e.g., cost, adoption on an individual account basis (including account level information), adoption rate, and rebate penetration by customer class.

(END OF ATTACHMENT E)

ATTACHMENT F

Summary and Questions Arising from Workshop on the Water-Energy-Telecommunications Nexus for Water and Energy Management, Infrastructure Safety, Public Safety, and Fire Safety

September 9, 2016

Supervisor Cliff Edson, Supervisor from Calaveras County, traveled to Middletown, California to present his plan to address the communications challenges that hindered Butte Fire response. (Copy of his presentation follows.) Forest fire potential and resulting greenhouse gas emissions are exacerbated by the devastation of the California drought and resulting bark beetle infestation that has most of the tree stock in Calaveras County. Some takeaways from the presentation were:

- Phone lines burned, underground phone lines melted, phone and cell lost
- Sheriff and 46 coordinating agencies worked together without communications
- Cell on Wheels provided for 1st responders
- Unmanaged watershed threw fireballs helping to further develop the fire
- At first rainfall, camping, chemicals, debris, waste, pesticides, stream into the chocolate river, sediment and sludge carried into reservoirs. Sludge takes up space in the reservoirs and clogs hydro and electricity procurement from water system.
- Calaveras County watershed feeds into East Bay San Joaquin Basin (water for vegetable growth comes from here)
- Overgrown forest and rangeland is destroyed, time to figure out how to bring back natural balance. Bark beetle can kill all the trees in 2 months creating fire danger at any lightning strike.
- Consider teachings of George Gruell, wildlife biologist, recreated old photos of the Sierras and noticed that there were 75% fewer trees in 1860s

pictures. Currently we stop fires resulting in heavy underbrush. Must consider forest management techniques.

- Consider teaching of Dr. Roger Bales, Founding Professor of Engineering at UC Merced regarding tree distance management to maximize water yield from watershed, slow down the movement of water, promote the return of meadows, properly managed water basins and flood control basins, habitat mitigation, aquifer recharge
- Develop better education to help property owners better manage forest and rangeland, reduce burns, increase value
- Consider developing Resource Conservation Districts (RCD) to promote water and energy management, project implementation, education, on flood control, wild fire reduction, rangeland management, agricultural development
- Consider portable bio mass plans for lower level electricity on the spot, develop computer monitoring for plants and data transmission with communications to optimize water and energy use
- Consider combining with torification plants
- Collaborate with FEMA on local tree knowledge in post fire rural mitigation strategies

Rural communities lack the same amenities of modern urban communities as a result of little to no access to internet services. Whether it be challenges to public safety in the event of forest fires, community organization without telephone or cell service or access to Facebook for information updates and relief options, Dead trees resulting from bark beetle infestation and weakened forests as a result of the ongoing California drought have created GHG releasing fire hazards that endanger communities, property, water facilities, electric infrastructure, telephone and internet infrastructure. The result of giant forest fires like the Rim Fire, the Butte Fire, the Valley Fire, the Sobrannes Fire (etc), have emitted GHGs, resulted in the deaths of humans, animals, property damage, fighting and rebuilding expenses in the millions.

Forestry management and rangeland management help to produce more water from our watershed areas to be captured in our waterways, used in hydroelectricity systems for energy production, and resources for consumption.

Questions

How can the water and energy utilities promote better forest and rangeland management? Who should the utilities consult and collaborate with to ensure highest possible water yields for our water and energy systems?

What tools are available to train rural community members and utility professionals on forest and range land management for improved stewardship of natural resources before they enter water and electric system?

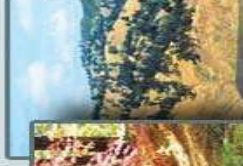
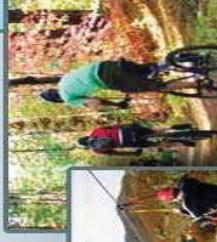
Rural communities up and down the state complain that (potentially illegal) pesticides from marijuana growth operations are entering surface water ways and creating water problems.

Should water and energy utilities collaborate with 3rd parties to better protect water and our natural resources used for drinking and electricity? How can water and energy utilities, that use water for the production of electricity, do a better job of protecting water sources to conserve on energy necessary to treat water to bring it to potable standards?

How can the CPUC ensure that proper communications and GPS identification is available for public safety identification in case of resource emergencies? How can utilities collaborate with local communities to ensure proper watershed and rangeland management to harness greatest water yields for maximum, hydroelectricity effectiveness?

Calaveras County

It's our life



Calaveras County
Watershed Pilot Program

Rural Counties Today

Rural Counties are Suffering with Economics and the Environment

- * Wildfire Danger
- * Diminished Property Values
- * Lower Property Tax Revenue
- * Land Use Restrictions
- * Infrastructure Challenge's
- * Shrinking Employment Opportunities
- * Declining School Enrollment
- * Students Pursue Education Elsewhere
- * Reduced Fire and Safety Resources
- * Influx of illegal Activities
- * Water
- * Aging Communities
- * Increase in Drug and Alcohol Use
- * Eroding Communities
- * Flood Zones Remain unmanaged

Our Forest Undermanaged

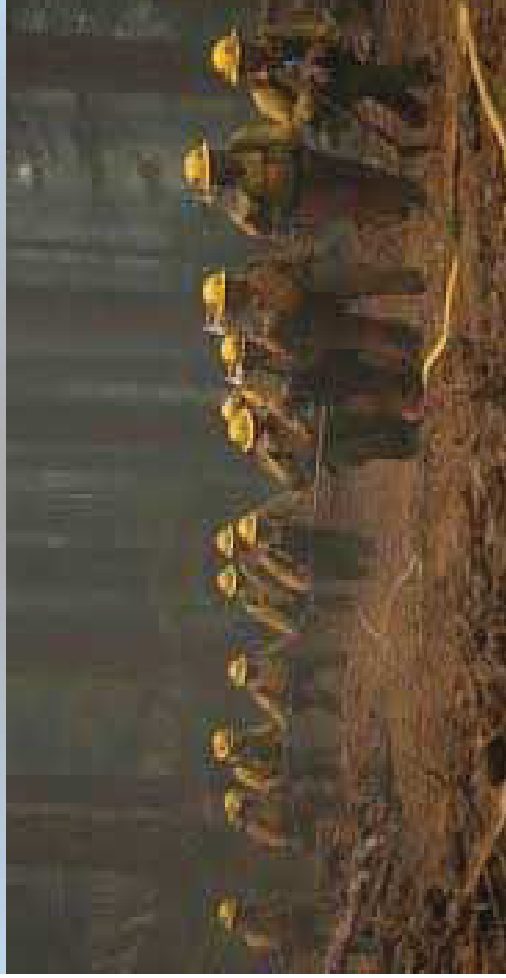
What We Have Now



When It Catches On Fire



People & Animals at Risk



What's Left



Our Rangeland Undermanaged

What We Have Now



When it catches on fire



Our Loved Ones at Risk



What's Left



Our Range & Basin Undermanaged

What We Have Now



When The Rain Comes



Unintended Consequences









The Butte Fire

























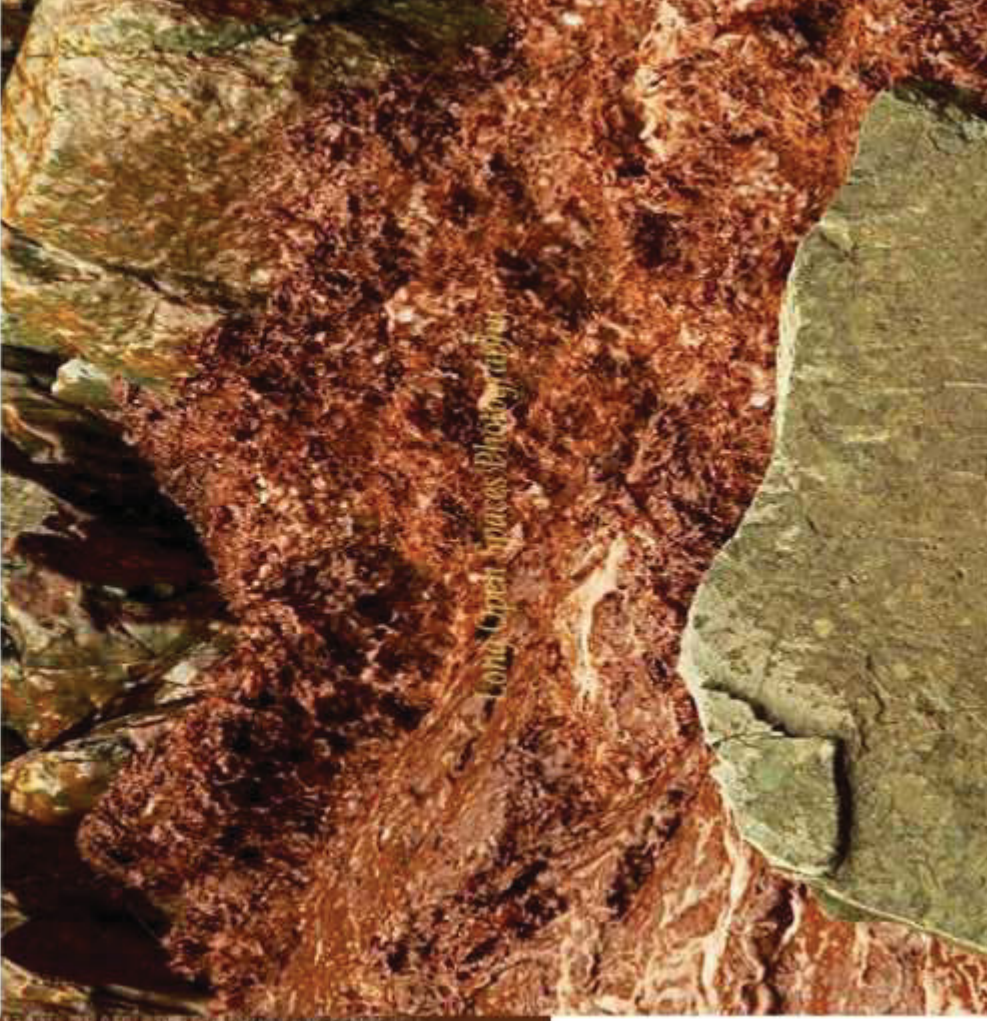




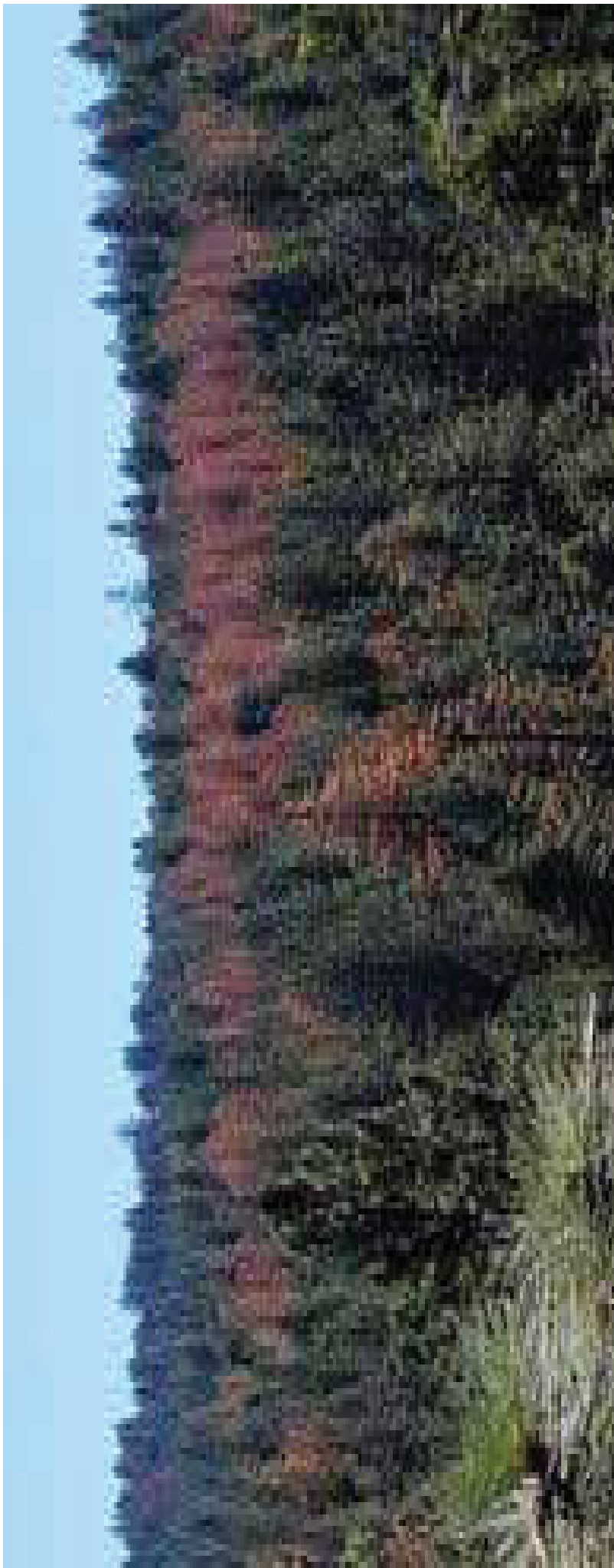
Butte Fire, Calaveras River

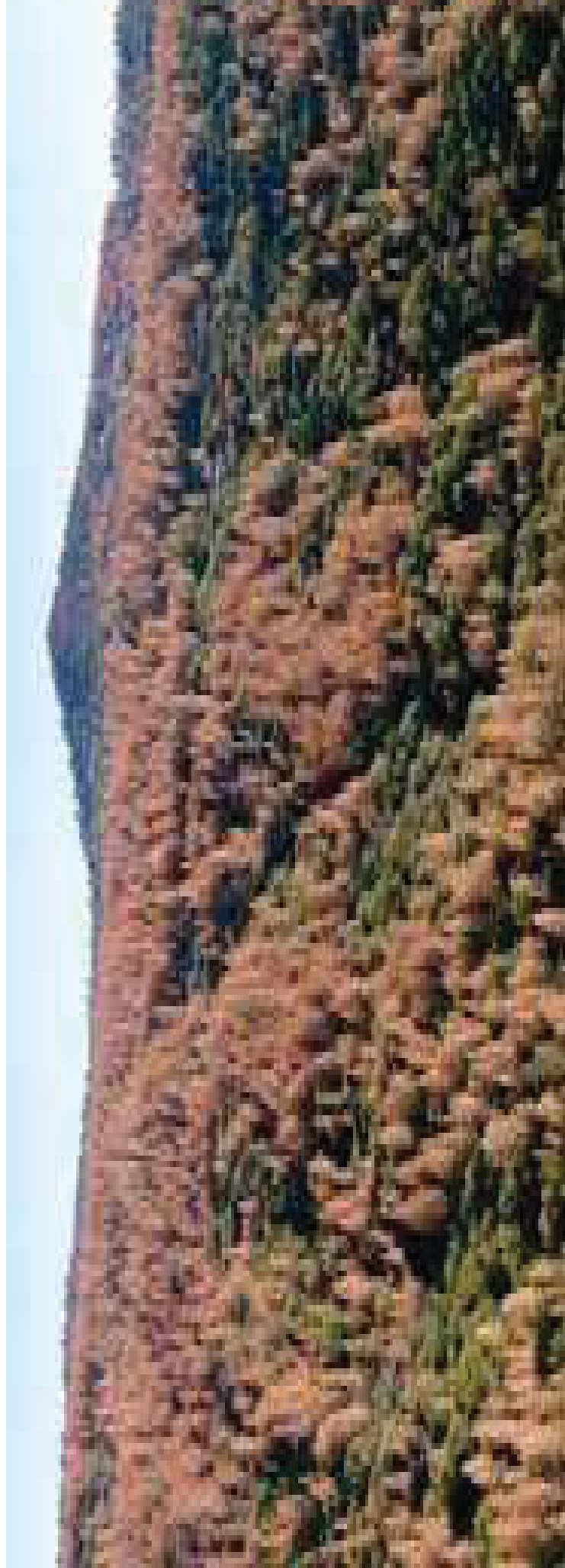


Chocolate Water



TREE MORTALITY







Calaveras County

It's our life



Leaping Into The Future
The Environment And The Economy
Working Together



Streams and Diversion Canals

23 Major streams and canals exist throughout Calaveras County and the feed into our Lakes and Reservoirs. Properly managing the Streams and Canals will minimize the damage to our water supply which currently reaches our Reservoir's.

- ❖ Streambed Alteration
- ❖ Erosion
- ❖ Pollutants
- ❖ Sediment Transfer
- ❖ Illegal Diversions

Calaveras County

It's our life



A Formal Watershed Management
Pilot Program

A Common Goal

Create a Pilot Program that Produces Value through Proper Watershed Management

The Pilot Program will Create:

- *Healthier Forests, Rangelands, and Basins
- *Encourage Agencies to Work Together
- *Reinvest in our Greatest Resources
- *Protect Property Rights through Program Incentives
- *Policies to Streamline Regulation where Possible
- *A Balanced Environmental and Economic Future
- *Healthy Communities and Sustainable Water Supply
- *Program Value for Stakeholder Investment

Skillful Collaboration

Working Successfully with Others to Achieve a Common Goal

The Calaveras County Resource Conservation District

- ❖ On the Ballot in June
- ❖ Grassroots Government Organization
- ❖ Advise and assist individual landowners and public agencies in planning and implementation of conservation practices for the protection, restoration, or development of land, water, and related natural resources.
- ❖ Local, Independent, Non-enforcement, Non-regulatory, Self-governed District
- ❖ 7 member board of directors. 1 director representing each Supervisor District, 1 Director representing the Ag Community, and 1 Director representing the Water / Wastewater Districts.
- ❖ Encompassing the County from border to border
- ❖ Become the central point for Calaveras County Projects

Our Forest Properly Managed

Properly Harvested



Maximizes Snowpack



Meadows Return



Increases Water Yield



Our Rangeland Properly Managed

An Example of a Study

Good Fire Prevention



Good for the Animals



Good for the Water



The Basin Properly Managed

Flood Control Basins and a Parks



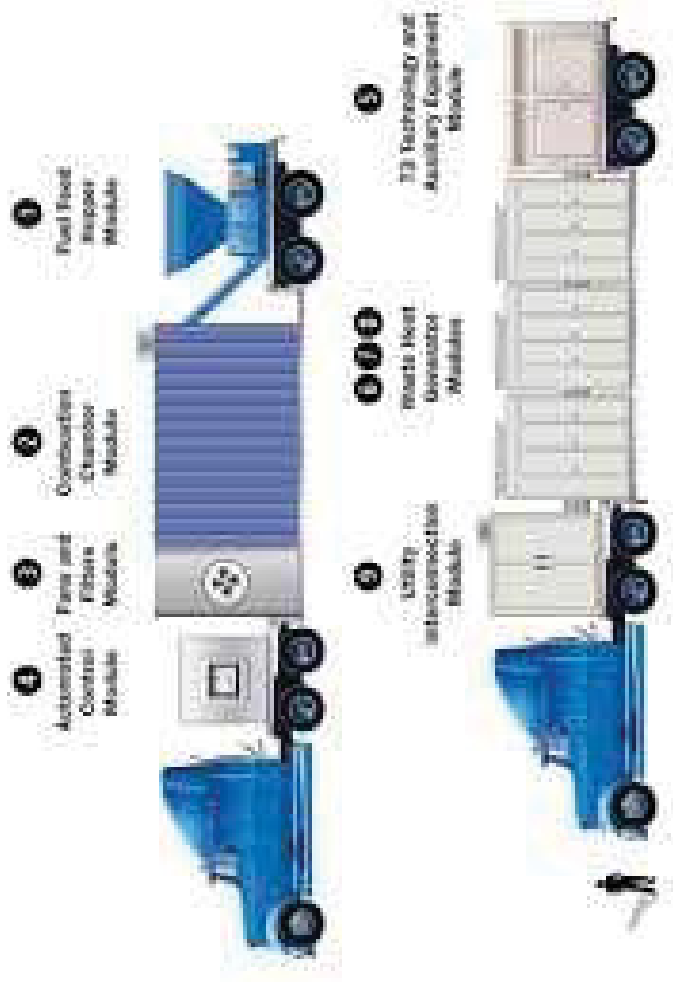
Good for Aquifer Recharge



Good for Habitat



Maximize Natural Resources





Future Calaveras

Putting Calaveras to Work

Developing New Methods



Educational Opportunities

Creating Jobs



Calaveras Watershed Management Pilot Program is fully engaged in bringing the principals of science and conservation to the development and implementation of a comprehensive and collaborative countywide program.”

“The best way to predict your future is to create it.”

—*Abraham Lincoln*

(END OF ATTACHMENT F)

ATTACHMENT G

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Ensuring Customer Premises Equipment Backup)	PS Docket No. 14-174
Power for Continuity of Communications)	
)	
Technology Transitions)	GN Docket No. 13-5
)	
Policies and Rules Governing Retirement Of)	RM-11358
Copper Loops by Incumbent Local Exchange)	
Carriers)	
)	
Special Access for Price Cap Local Exchange)	WC Docket No. 05-25
Carriers)	
)	
AT&T Corporation Petition for Rulemaking to)	RM-10593
Reform Regulation of Incumbent Local Exchange)	
Carrier Rates for Interstate Special Access)	
Services)	

**COMMENTS OF THE
EDISON ELECTRIC INSTITUTE**

The Edison Electric Institute (“EEI”) hereby submits these comments in response to the Federal Communications Commission's ("FCC" or "Commission") Notice of Proposed Rulemaking and Declaratory Ruling ("NPRM") released in the above-referenced proceeding on November 25, 2014.¹ In the NPRM the Commission asks, *inter alia*, a number questions regarding what changes are required to ensure that the Commission's copper retirement process protects retail customers (including non-residential users such as businesses and anchor institutions) and facilitates completion, and whether the FCC should revise its rules with regard to Section 214 service discontinuances.

¹ *In the Matter of Ensuring Customer Premises Equipment Backup Power for Continuity of Communications, et al.*, Notice of Proposed Rulemaking And Declaratory Ruling, PS Docket No. 14-174, *et al.* (Nov. 25, 2014).

Given the importance to electric utilities of copper loops and various services and equipment related thereto, as well as problems utilities are coming to face as a result of copper retirement and section 214 discontinuances, EEI focusses its comments on these topics.

I. SUMMARY

Electric utilities welcome the FCC's inquiry into these matters, though they are troubled that – with the noted exception of the Utilities Telecom Council (“UTC”) – no party commenting in this proceeding has addressed the issues that are critical to electric utilities and essential to their continuing provision of reliable, resilient and secure service. Electric utilities extensively rely on copper-based services and facilities provided by Incumbent Local Exchange Carriers (“ILECs”) for a variety of important utility functions, some of which are critically related to public safety as well as system control and monitoring.

Electric utilities have suffered from every problem recounted by the FCC in its NPRM related to copper retirement and service discontinuance including *de facto* retirements, inadequate notice of retirement or discontinuance, the imposition of repeated price increases as a means of effectively forcing utilities off copper, being forced to accept much higher fiber-related costs, ILEC offerings of inadequate substitutes, and impairment of services provided to electric utilities by competitive Local Exchange Carriers (“CLECs”) resulting from copper retirements and discontinuances. The problem is exacerbated for electric utilities because the transition to all-Internet Protocol (“IP”) networks involves thousands of lines in many locations, can take up to five years to achieve, and can result in additional costs of \$60-85 million which must be recovered by electric utilities in state rate cases. Moreover, some of the substitute services offered to utilities by ILECs are inadequate for their communications needs, while IP services come at a higher cost, forcing many electric utilities to replace ILEC service altogether by

building their own internal networks, even though they face the problem of the lack of available spectrum.

Faced with these realities and their implications for electric utilities' provision of safe, reliable service to customers nation-wide, EEI urges the FCC to take the following actions with respect to copper retirements:

1. Ensure that electric utilities as well as other impacted business and retail customers of carriers are provide adequate notice of, and an opportunity to comment on, copper retirements and service discontinuances contemplated by carriers.
2. Require carriers to provide an adequate transition period (*i.e.*, 3-5 years), rate stability for customers during that transition period, and to continue maintenance on all copper facilities until they are fully retired at the end of the transition period.
3. Ensure that ILECs offer reliable, resilient and cost-efficient substitutes for retired or discontinued facilities and services.

II. COMMENTS

A. Edison Electric Institute

EEI is an association of United States investor-owned electric utilities and industry associates worldwide. Its U.S. members serve almost 95 percent of all customers served by the shareholder-owned segment of the U.S. industry, about 70 percent of all electricity customers, and generate about 70 percent of the electricity delivered in the U.S. EEI frequently represents its U.S. members before Federal agencies, courts and Congress in matters of common concern, and has filed comments with this Commission and others in various proceedings affecting the interests of its members.

EEI's members make extensive use of communications as providers of critical infrastructure industry ("CII") services, both as owners and operators of private communications systems, and as end-users of commercial communications networks. They are in fact among this

nation's largest users of communications networks and services and, over the years, have invested and continue to invest billions of dollars in communications plant as this nation's electric grid is modernized. Even with these investments in their own networks for the purposes of security, reliability and efficiency, these utilities still tend to make extensive use of wireline services, particularly copper loops and related services and equipment for their non-critical (*e.g.* not related to public safety or grid management) but still important communications.

B. Electric Utilities Make Extensive Use of Communications – Particularly Copper Facilities and Services – in the Provision of CII Electric Service, and Therefore Have A Substantial Stake in the IP Transition.

This nation's electric utilities have a clear stake in the discussion surrounding IP transition, copper retirement and section 214 discontinuances. Nearly every electric utility today relies on Frame Relay and other time-division multiplexed ("TDM") enterprise wireline carrier services to support critical control data as well as critical facilities such as substations. A recent survey of the types of services leased by electric utilities found that 44% of respondents leased Frame Relay, 42% leased 4-Wire, Class A Service, and 82% leased 4-Wire, Class B Service, Full Duplex (Data).²

Like the telecommunications industry, the electric grid is in the midst of a far-reaching modernization effort vis-à-vis grid modernization. Mindful of this, EEI recognizes that transitions of the sort in technology and infrastructure are inevitable, and the electric industry wishes to facilitate, rather than impair, this transition process. However, any transition away from a technology that is so heavily relied upon by the utility industry must be done in a manner so as to avoid impacting the ongoing reliability, resiliency and security of the electric grid.

² EEI Transmission Strategic Advisory Committee, Telecommunications Survey Presentation at 11 (Apr. 9, 2014).

Yet while numerous telecommunications carriers have announced plans to discontinue Frame Relay and other service, electric utilities have no firm assurance that they will be timely notified by carriers in advance with sufficient enough time to take action, or afforded opportunity to comment on, or object to, such changes. In fact, some utilities have either been notified after the fact or given less than ninety (90) days' notice of discontinuance. This poses much uncertainty and numerous operational problems for utilities in their provision of critical electric service.

C. Most Electric Utilities Have Been Impacted by *De Facto*, Actual or Proposed Retirement of Copper, and Service Discontinuance.

Significantly, 73% of respondents had been notified by their carrier that services would be terminated. 55% had been notified that their Frame Relay services would be terminated, 39% that their 4 Wire Class A services would be terminated, and 52% that their 4 Wire Class B services would be terminated.³ Moreover, electric utilities have suffered from *de facto* service discontinuances as ILECs have begun to cease to maintain their copper facilities. In many of these cases the notice provided to utilities from their carriers has been totally inadequate because, given the thousands of lines, numerous locations, and millions of dollars of transition costs involved, it is impossible for electric utilities to reasonably transition away from discontinued services in less than 3-5 years.

The problems faced by utilities are significant: 87% of the respondents indicated that there had been capital budget impacts, and 82% that there had been manpower resource issues as a result of the discontinuances.⁴ Among the difficulties cited by the companies were the following:

³ *Id.*

⁴ *Id.* at 14.

- The need to build private networks to replace the copper facilities.
- Unrealistic conversion schedules.
- Potential operational and security impacts.
- Lack of resources to complete the conversion.
- O&M budget impact with higher monthly recurring costs and unexpected rate increases.
- Inability to find low-cost or adequate substitute services.

D. FCC Should Revise its Copper Retirement Rules and Processes to Require ILECs to Provide Notice To, and Permit Comment By, Their Customers, Including Business Customers Such As Electric Utilities.

Attached as Exhibit A to these comments are responses from various electric utilities of differing sizes and service territories to questions posed by EEI in an attempt to secure anecdotal information regarding the problems faced by electric utilities as a result of copper retirements and discontinuances.⁵ The questions are similar to those posed by the Commission and the answers parallel the results of the survey.

EEI agrees with UTC that there is good reason for the Commission to revise its copper retirement rules to expand notice requirements to electric utilities as well as other business customers who have come to rely on these services.⁶ As it stands, utilities are being provided with inconsistent and insufficient levels of notice from the carriers concerning service discontinuances, at times forcing utilities to find alternative solutions for their communications in short order to maintain their critical operations. UTC is correct to note that the services being discontinued by carrier impact the safety, reliability and security of utility operations, and it is for this reason that the public interest would be served if the Commission were to extend its

⁵ See EEI Member Responses: FCC IP Transition Survey – Feb. 2015, attached hereto as Exhibit A (“EEI Exhibit A”).

⁶ See Comments of the Utilities Telecom Council, PS Docket No. 14-174, at 7-9 (filed Feb. 5, 2015).

notice requirements to include customers of ILECs and, in particular, electric utilities.⁷ It is crucial that such notice period be longer than the 30 days provided under the FCC's current rules for CLECs. To accommodate the needs of utilities, which have thousands of lines at numerous locations, and which have high standards for reliability and resiliency, EEI supports UTC's suggestion that carriers be required to provide utilities with at least a year of advance notice.⁸

And, like UTC, EEI voices strong support for the Commission's proposal to provide an opportunity for consumers to comment in response to notification by the Commission that a carrier intends to discontinue service in a given area. This proposal should be made to apply specifically to electric utilities and CII.⁹

E. FCC Should Establish an Adequate Transition Period (*i.e.*, 3-5 years), During Which Time Carriers Are To Provide Rate Stability for Customers and Continued Maintenance of Copper Facilities.

EEI urges FCC to establish an adequate transition period of three to five years, over which time carriers may retire or discontinue copper and related services. A three- to five-year transition window is essential for electric utilities given the numerous circuits involved, as well as the planning that must be done by utilities in response to such retirements. The FCC should further require carriers to provide such notice in a clear, consistent manner to ensure utilities are properly notified. Currently, electric utilities report receiving notice from their carriers of facility or service retirements or discontinuances in an inconsistent and disjointed manner – at times through verbal communications or other non-formal channels – and with insufficient lead-time to enable utilities to plan.¹⁰ This phenomenon is troubling, and effectively denies utilities

⁷ *Id.* at 8.

⁸ *Id.* at 8-9.

⁹ *Id.* at 8.

¹⁰ *See, e.g.*, EEI Exhibit A at 1 (Ameren), 6 (Cleco), 10 (LG&E/KU), 12 (NextEra), 14 (PG&E), 16 (PPL), 18 (PSEG)

the time they need to conduct thorough reviews of security protocol services and reliability, and engage in financial preparation and implementation of new services.¹¹

The FCC should further ensure that, during this three- to five-year transition period for retirements or discontinuances, carriers provide rate stability for their customers, and continue to maintain all copper facilities until they are fully retired at the end of the transition period.

F. FCC Should Ensure that ILECs Provide Reliable, Resilient and Cost-Efficient Substitutes for Retired or Discontinued Facilities and Services.

In order to protect customers, competition and public safety, the Commission has sought comment on what constitutes an adequate substitute for a retail (including business) service being discontinued, reduced, or impaired. In the view of EEI, the FCC should require a demonstration, as part of the section 214 discontinuance process, that any IP-supported network or network components offer comparable communications security, integrity and reliability. In addition, the FCC should adopt a rebuttable presumption that section 214 approval is required where the discontinuance or impairment pertains to wholesale service given the importance of these services to CII entities such as electric utilities.

Finally, the FCC is correct in concluding that it should require ILECs seeking section 214 authority with regard to a legacy service used as a wholesale input by CLECs to commit to providing equivalent wholesale access on equivalent rates, terms, and conditions.

III. CONCLUSION

EEI supports the FCC's efforts in this proceeding to consider issues critical to the IP Transition, and it asks the Commission to act consistent with these comments to ensure that its copper retirement process protects electric utilities and other impacted customers by:

¹¹ See EEI Exhibit A at 16 (PPL).

1. Ensuring customers of carriers are provide adequate notice of, and an opportunity to comment on, copper retirements and service discontinuances contemplated by carriers;
2. Requiring carriers to provide an adequate transition period (*i.e.*, 3-5 years), rate stability for customers during that transition period, and to continue maintenance on all copper facilities until they are fully retired at the end of the transition period; and
3. Ensuring that ILECs offer reliable, resilient and cost-efficient substitutes for retired or discontinued facilities and services.

Respectfully submitted,

EDISON ELECTRIC INSTITUTE
/s/ David K. Owens /
David K. Owens
Executive Vice President

Aryeh B. Fishman
Associate General Counsel,
Legal Regulatory Affairs
Office of the General Counsel

H. Russell Frisby, Jr.
Jonathan P. Trotta
Counsel
STINSON LEONARD STREET LLP
1775 Pennsylvania Ave, NW
Suite 800
Washington D.C. 20006
(202) 785-9100
(202) 785-9163 (Fax)
russell.frisby@stinsonleonard.com
jonathan.trotta@stinsonleonard.com

Edison Electric Institute
701 Pennsylvania Avenue, NW
Washington, DC 20004-2696
(202) 508-5000
afishman@eei.org

Dated: March 9, 2015

Exhibit A

**EEI Member Responses: FCC IP Transition Survey
February, 2015**

EEI Member Company: Ameren

1. What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?

A. Ameren utilizes 4 wire Type 3002 Class A and Class B circuits for SCADA and Relaying services. We utilize VM circuits for Telemetry services. We have some dry copper pairs for misc. substation services. We utilize T-1 services for substation and WAN connectivity. We have some 56kb digital circuits for some substation communications. We also have TDM based DS-3 circuits for WAN connectivity. For voice, we still utilize POTS, T-1, ISDN, analog DID, analog COT, analog DOD, and E911 CAMA trunks. In addition, we utilize copper based ADSL for some remote connectivity to facilities.

2. Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?

A. AT&T has informed Ameren of their intention to eliminate all TDM services by 2020.

Some smaller regional/rural phone companies have informed us and have already eliminated copper plant from their facilities and have forced us over to a cellular connection or forced us to install additional power facilities to power their fiber equipment.

3. Have any of the copper facilities used by your company been "de facto" retired?

A. Yes, but only by smaller, rural/regional phone companies that have gotten grants/funding to move all facilities off of copper. Widespread elimination of facilities have not yet occurred.

4. How were the retired or discontinued facilities or services used?

A. Mainly for voice communication and modem communication to non-critical locations.

5. If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?

A. Approximately 180 days on average

6. How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?

A. Analog services have gone up over 120% at the last contract renewal and we have been informed to expect similar, if not higher increases to the costs at each renewal.

Over the last 6 months, phone companies are now starting to charge infrastructure installation charges for traditional T-1 services based upon "special construction charges". This has not been seen in the last 15 years for non-fiber based construction or for non-high voltage cable construction.

Reliability and Service restoral has drastically gotten worse. The phone companies no longer will send personnel out after normal business hours or weekend to repair any analog

service. Their core T-1 services have also been impacted by reliability and repair issues where the circuits are not being repaired in a timely manner.

For any substations that are needing any changes to communications, the phone companies are beginning to push for fiber into the substation and has priced a very large installation cost for install of the fiber and expects the customer to pay for that large expense.

7. What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?

A. Ameren will be investing in a mainly private solution of fiber, microwave, and wireless to eliminate most telephone company services. This investment will be made over the next 5-10 years.

8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?

A. No, not yet.

9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?

A. Nothing from a telephone company provided service. We are looking to go mostly all private.

10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?

A. We would need to evaluate the business case for the purchase of the existing facilities and compare it to the cost of running our own facilities on our existing Right of Ways.

11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?

A. There is a concern with cyber security surrounding how secure the data to critical assets would be utilized public data networks.

From a reliability standpoint, the phone companies have told us their plan to provide last mile service is from the utilization of cellular technologies, which are not reliable enough in the event of a major disaster or event.

For relaying services, the existing RBOC provided data circuits will not provide compatible services or reliability needed for critical power line tripping/monitoring capability.

12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?

- A. Ameren only utilizes POTS lines and PBX trunks from CLECs. We he not be notified of any changes in service, but expect that to occur since the CLEC we utilize is just reselling services provided by the local RBOC..

EEI Member Company: ATC

1. What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?

- A. Frame Relay/MPLS with Class B Service
Channelized T1 with Class A and Class B Service
4-Wire with Class A Services

2. Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?

- A. No retirements at this time, but ATC has been notified 4-wire services will be disconnected in Oct-2019.

ATC has been told that Channelized T1 services are not available in all areas. It appears the RBOC will only provide only MPLS-IP over T1 services.

3. Have any of the copper facilities used by your company been "de facto" retired?

- A. Not at this time, but were told by RBOC field service technician that 4-wire service equipment is not supported by the manufactures and replacement cards are becoming difficult to find.

4. How were the retired or discontinued facilities or services used?

- A. During our AT&T October 2014 Stewardship meeting, ATC was notified of the 4-wire planned retirement (October 2019).

During our Wisconsin Inter-Utility Telecom Meeting (February 2015), we heard that TDM services and High Voltage Equipment has been targeted for retirement around 2020. At our next AT&T Stewardship meeting, the TDM services and HVP equipment retirement plan will be added to our meeting agenda.

5. If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?

- A. AT&T formal 4-wire notification came five years before the termination date. Five year notification is too short for proper planning and execution. A seven year notification would be our preference.

6. How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?

- A. The Analog (4-wire) circuits were no longer eligible to group term rate discounts. The 4-wires circuits now are month to month services which has been subjected to 25 percent increase every four months. We considered this as price gouging.

7. What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?

- A. ATC has taken steps to develop the following strategy:
- i. Install OPGW (Optical Ground Wire) to replace 4-wire circuits
 - ii. Install Power Line Carrier to replace 4-wire circuits
 - iii. Evaluate Cellular services for voice and data applications to replace analog services
 - iv. Evaluate Wireless services (Microwave and Radio)

8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?

- A. Channelized T1 are difficult to order – Replaced by MPLS-IP T1 services.

9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?

- A. ATC has developed a replacement plan for 97% of 4-wire circuits. The remaining 3% involve collaboration with non-ATC customers for the appropriate solution.

10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?

- A. Yes – In our industry, our critical communication infrastructure is highly dependent on copper to support TDM base communication services. In addition, most of our substations locations are rural areas where cellular and fiber infrastructure is not available or cost prohibitive to build-out cost.

11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?

- A. ATC is currently evaluating best integration and security practices for IP-based services.

12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?

- A. Yes, but it appears the larger CLECs are moving away from TDM and over to MPLS-IP base services.

EEI Member Company: Cleco

- 1. What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?**

A. T1 and less than six 4-wire. We disconnected all 4-wire possible due to escalating cost.

- 2. Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?**

A. N/A

- 3. Have any of the copper facilities used by your company been "de facto" retired?**

A. Forced to discontinue 4-wire due to 30% price increase semi-annually

- 4. How were the retired or discontinued facilities or services used?**

A. SCADA

- 5. If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?**

A. 3 months. 2 years is desirable.

- 6. How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?**

A. Spent capital dollars to install wireless networks to accommodate offloaded circuits.

- 7. What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?**

A. Built out private wireless networks.

- 8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?**

A. No.

- 9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?**

A. Yes, private wireless.

- 10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?**

A. No.

11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?

A. N/A

12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?

A. No, only AT&T.

EEI Member Company: Integrys

- 1. What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?**

A. 4 wire services, copper loops, copper T-1.
- 2. Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?**

A. They have not been retired yet but we have been told of discontinuance but not with any formal date as of yet.
- 3. Have any of the copper facilities used by your company been "de facto" retired?**

A. No but support of those facilities has become practically non-existent.
- 4. How were the retired or discontinued facilities or services used?**

A. N/A
- 5. If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?**

A. N/A
- 6. How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?**

A. Although not discontinued as of yet, the increased cost of these facilities makes them very undesirable.
- 7. What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?**

A. All of the above. We will use every strategy available to us to remove these old legacy copper facilities and move them to an IP based service. We have even used satellite to good success. We also use M-M cellular.
- 8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?**

A. Yes.
- 9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?**

A. Yes but it takes a big investment in time and money on our part to do this.

10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?

A. No.

11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?

A. For the most part, yes however the RBOC's are usually higher priced than their competitors, including cable companies.

12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?

A. Yes we look for the best provider based on cost, availability and service. We use many competitive carriers in our search for new network facilities usually at a competitive advantage to us.

EEI Member Company: Louisville Gas & Electric Company; Kentucky Utilities Company

- 1. What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?**

A. 4-Wire Class B Service Full Duplex, T1's, POTS lines.

- 2. Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?**

A. Yes, we have received notice (verbal) of retirement of copper based T1's and 4 Wire Class B service; we have been told T1's will be retired in the 2020 time frame and 4 Wire Class A service will be retired by the end of 2019. We have also had several regional telco's already discontinue analog services (we have replaced these with T1's).

- 3. Have any of the copper facilities used by your company been "de facto" retired?**

A. Not yet.

- 4. How were the retired or discontinued facilities or services used?**

A. SCADA circuits, Security circuits, Radio circuits, IP Data.

- 5. If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?**

A. We were given verbal notice of the 4 Wire Class B service retirement in 2013 and for the T1s, in late 2014.

Timing was inadequate and no formalized document was shared with us showing exact turn down dates. Carrier would not commit to verbal dates in recent contracts.

We would prefer to receive 5-10 years notice depending on the applications using retired services

For the regional telcos, virtually no advanced notice is given.

- 6. How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?**

A. Higher telecom bills, increased O&M expense and effort, equipment made obsolete, poor service restoration by carriers; significant capital cost to provide channel equipment and modernize high voltage protection packages.

- 7. What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?**

- A. Considering multiple options: MPLS, VPLS, Ethernet service, wireless, building out our internal network to reach sites traditionally served by sites served by these retired services, etc.
- 8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?**
- A. Not yet.
- 9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?**
- A. Investigating possible solutions now.
- 10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?**
- A. No.
- 11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?**
- A. Unsure at this point; none are being used.
- 12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?**
- A. Yes, and meet point circuits are impacted as well.

EEI Member Company: NextEra

- 1. What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?**
 - A. Pretty much all of the items listed. As large as NextEra (NEER) is we are going to have a pretty much all types of services offered by the RBOCs.
- 2. Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?**
 - A. We have seen the retirement of Frame Relay by ATT. Now moving in the same direction with Embarq.
- 3. Have any of the copper facilities used by your company been "de facto" retired?**
 - A. I would say we are seeing a form of "de facto" retirement in that the carriers are beginning to drop SLAs and move to best effort service for systems the carriers are phasing out.
- 4. How were the retired or discontinued facilities or services used?**
 - A. No response.
- 5. If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?**
 - A. NEER was not satisfied with the timing of the notification nor the willingness of the carriers to negotiate a transition schedule. Proper notice should be handled through an annual update by the carriers on their technology roadmap.
- 6. How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?**
 - A. High system replacement cost and higher O&M cost for replacement service.
- 7. What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?**
 - A. Have constructed numerous MPLS systems for recently replaced systems and will need to build more MPLS systems as other services are retired or experience service degradation as systems reach EOL.
- 8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?**
 - A. Degrading performance on DSOs, DS1s and similar services are leading us to transition systems to IP services.

9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?

- A. Solutions have been found but it has created a challenge in the acquiring budget and resources to implement.

10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?

- A. NEER is probably not interested in this option. At most this would be considered for a special case situation only where the business impact of change is extremely burdensome.

11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?

- A. For the most part there is the option to provide a solution that is comparable or better though the cost to deliver the service is typically much higher.

12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?

- A. Don't really utilize enough of the competing services to see an impact.

EEI Member Company: PG&E

1. **What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?**
 - A. Minimal Frame Relay services,
Approximately 3500 DS0 Class A and Class B, 2 Wire and 4 Wire leases
Approximately 1000 DS1 leases
2. **Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?**
 - A. Yes, Verizon has provided notice that "Class" A DS0 level leases have been discontinued
3. **Have any of the copper facilities used by your company been "de facto" retired?**
 - A. Yes, one power plant experienced outages during rain storms and despite repeated trouble tickets was never adequately repaired. Eventually, PG&E paid AT&T to replace the copper cable with Fiber to improve the reliability and allow safe and reliable operations of the power plant.
4. **How were the retired or discontinued facilities or services used?**
 - A. Electric Protection, Station Automation (SCADA), IP Network Connections.
5. **If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?**
 - A. Verizon stopped filling orders for Class A services in January 2014, and notified PG&E via a bill insert in Sept 2014. This is about a negative 9 month notice. Notification was not timely given the amount of circuits involved, clearances and notifications needed, and budgetary planning necessary to facilitate replacements. We would need 3-5 years to effect a change of this magnitude given the number of circuits involved.
6. **How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?**
 - A. Replacement services proposed by carriers are approximately 20-30 times the current monthly recurring cost. Most DSO leases are \$40-50/Mo, MPLS services are \$1000-1500/Mo. At this point carrier based MPLS services have not been tested and approved for some utility applications (electric protection).
7. **What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?**
 - A. We have a program that proposes to migrate to satellite, Private Radio, MPLS Leases, Private Microwave, or Fiber as necessary to meet the communications needs of the facility. However, given the minimum notification time we still need to explore other options.

8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?

A. Yes, aside from the hydro site mentioned above, we had another instance where unreliability of telephone service remote facilities caused PG&E to install a private system for employee safety.

9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?

A. For some services such as SCADA, replacement services are available and adequate, for others such as electric protection no reliable replacement has been identified.

10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?

A. This does not appear to be a practical option due to the significant amount of unknowns involved in this type of agreement.

11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?

A. No they have not offered any solutions which match Class A level circuit security, integrity or reliability.

12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?

A. Yes we do lease from CLECs, they have not been affected to my knowledge at this point.

EEI Member Company: PPL

- 1. What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?**
 - A. Currently we purchase Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops; 2 and 4 wire RTNA circuits.
- 2. Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?**
 - A. Currently no services have been retired. Yes, our company has received notice that Newbridge equipment and 4W services will be affected.
- 3. Have any of the copper facilities used by your company been "de facto" retired?**
 - A. Currently, no.
- 4. How were the retired or discontinued facilities or services used?**
 - A. N/A
- 5. If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?**
 - A. Our company would prefer to receive a minimum of 5 years. This time is to allow for research of security protocol services, reliability, financial preparation and implementation of the new services.
- 6. How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?**
 - A. Currently not impacted.
- 7. What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?**
 - A. Our company has documented all circuit requirements from a security service and reliability perspective, issued an RFI to understand replacement technologies being offered and engaged vendors in discussions of the services mentioned above.
- 8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?**
 - A. No.

9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?

A. Although not cost effective, we have determined there are technologies we expect to be able to deploy in lieu of current technologies.

10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?

A. We would explore that option.

11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?

A. To our knowledge, we believe they do.

12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?

A. No CLECs.

EEI Member Company: PSEG

- 1. What type of copper based services and facilities does your company obtain from the Regional Bell Operating Companies (RBOCs) (e.g. Frame Relay, 4-Wire Class A Service, 4-Wire Class B Service Full Duplex, copper loops or feeders etc.)?**

A. Frame Relay, ISDN, POTS

- 2. Have any copper facilities and services used by your company been retired by the RBOCs or has the company received any notices of discontinuance?**

A. Yes, Frame Relay service; we've been told that TLS also will sunset, but no specific date has been announced.

- 3. Have any of the copper facilities used by your company been "de facto" retired?**

A. Not 'retired', per se. For example, Verizon invokes IEEE 487 any time a VZW service is placed at a location that involves voltages of 20kV or above. This forces us to add ground potential rise isolation that adds significant cost.

- 4. How were the retired or discontinued facilities or services used?**

A. Monitoring of data points (SCADA), physical security.

- 5. If facilities or services were retired or discontinued, how much notice was given? Was this notice either timely or adequate? How much notice would your company prefer to receive?**

A. The carriers do not inform us directly. We learn of service discontinuance via FCC Public Notices, industry associations or, sometimes, from the carrier's account manager. Notice via these means never is timely. Because the design of replacement services can take several years, the notice provided never has been sufficient.

- 6. How was your company affected by the retirements or discontinuances (e.g. higher telecom bills, increased O&M expense and effort, software or equipment made obsolete, etc.)?**

A. Higher telecom rates for the minimum replacement service, each location requiring construction to pull in Fiber services.

- 7. What steps did your company take or will it have to take to replace the retired or discontinued facilities and services (e.g. lease fiber, move to Multiprotocol Label Switching (MPLS), build internal networks, move to wireless etc.)?**

A. Moved Frame Relay services to MPLS, with Fiber into facilities from the LEC's serving central office. We will move approx. 35% of the carrier provided circuits to private fiber.

- 8. Independent of any retirement or discontinuance, have any of your company's leased telecom services been impaired to the extent that your company has been forced to move to RBOC IP services and facilities?**

A. No.

9. Has your company found adequate substitutes for the retired, discontinued or impaired facilities and services?

A. Yes, but at a 30% rate increase.

10. Would your company be interested in purchasing the copper facilities from the RBOCs in lieu of retirement?

A. Yes

11. Do the RBOCs IP-supported networks or network facilities offer comparable communications security, integrity and reliability?

A. Yes.

12. Does your company lease services or facilities from competitive carriers (CLECs)? If so have these services been affected?

A. No, not impacted.

(END OF ATTACHMENT G)